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LLNL-TR-404997

Formal Management Review of the Safety Basis Calculations Noncompliance

T. J. Altenbach

June 27, 2008

Disclaimer

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Formal Management Review of the Safety Basis Calculations Noncompliance

December 8, 2006

Prepared by: **Date:**

T. J Altenbach 12/8/06

Tom Altenbach, Authorization Basis Section Deputy Leader

Approved by: **Date:**

David Pinkston 12/8/06

David Pinkston, Authorization Basis Section Leader

Concurred by: **Date:**

12/11/06

Howard Wong, Safety Programs Division Leader

Concurred by: **Date:**

12/19/07

Mark Martinez, Nuclear Materials Technology Program Leader

Concurred by: **Date:**

1/16/07

Stephanie Goodwin, Environmental Protection Department Head

Concurred by: **Date:**

12/18/06

Dennis Barrett, Packaging and Transportation Safety Program Leader

HC/AB 2006 199

Formal Management Review of the Safety Basis Calculations Noncompliance

Introduction

In Reference 1, LLNL *"identified a failure to adequately implement an institutional commitment concerning administrative requirements governing the documentation of Safety Basis calculations supporting the Documented Safety Analysis (DSA) process for LLNL Hazard Category 2 and Category 3 nuclear facilities."*

"The AB Section has discovered that the administrative requirements of AB Procedure AB-006, "Safety Basis Calculation Procedure for Category 2 and 3 Nuclear Facilities," have not been uniformly or consistently applied in the preparation of Safety Basis calculations for LLNL Hazard Category 2 and 3 Nuclear Facilities."

"The SEP Associate Director has directed the AB Section to initiate a formal management review of the issue that includes, but is not necessarily limited to the following topics: (1) the basis establishing AB-006 as a required internal procedure for Safety Basis calculations; (2) how requirements for Safety Basis calculations flow down in the institutional DSA process; (3) the extent to which affected Laboratory organizations have explicitly complied with the requirements of Procedure AB-006; (4) what alternative approaches LLNL organizations have used for Safety Basis calculations and how these alternate approaches compare with Procedure AB-006 requirements; and (5) how to reconcile Safety Basis calculations that were performed before Procedure AB-006 came into existence (i.e., August 2001). The management review will also include an extent-of-condition evaluation to determine how widespread the discovered issue is throughout Laboratory organizations responsible for operating nuclear facilities, and to determine if implementation of AB procedures other than AB-006 has been similarly affected."

In Reference 2, Corrective Action #1 was established whereby *"the SEP Directorate will develop a plan for performing a formal management review of the discovered condition, including an extent-of condition evaluation."*

In Reference 3, a plan was provided to prepare a formal management review, satisfying Corrective Action #1 above. An AB-006 Working Group was formed, led by the AB Section, with representatives from the Nuclear Materials Technology Program (NMTP), the Radioactive and Hazardous Waste Management (RHWM) Division, and the Packaging and Transportation Safety (PATS) Program. The key action of this management review was for Working Group members to conduct an assessment of all safety basis calculations referenced in their respective DSAs.

Those assessments were tasked to provide the following information.

- *"List which safety basis calculations correctly follow AB-006 and therefore require no additional documentation."*
- *"Identify and list which safety basis calculations do not strictly follow AB-006. These include NMTP Engineering Notes, Engineering Safety Notes, and calculations by organizations external to the nuclear facilities (such as Plant*

Engineering), subcontractor calculations, and other internally generated calculations. Each of these will be reviewed and listed on a memorandum with the facility manager's (or designee's) signature accepting that calculation for use in the DSA. If any of these calculations are lacking the signature of a technical reviewer, they must also be reviewed for technical content and that review documented per AB-006."

Noncompliance Report Issues

The Noncompliance Report NTS-OAK-LLNL-LLNL-2005-0010, "Failure to Implement Institutional Commitment Concerning Documentation of Safety Basis Calculations," May 31, 2005, lists five actions to be undertaken as part of the formal management review. The response to each action item follows.

1. **Review the basis establishing AB-006 as a required internal procedure for Safety Basis calculations**

   - The purpose for preparing AB-006 was to meet Appendix O requirements (as negotiated with NNSA/LSO) and general QA requirements from 10CFR830 Subpart A.
   - A letter from Michael Anastasio (as Deputy Director for Strategic Operations) to Michael Hooper (Assistant Manager for NNSA Operations at the DOE Livermore Site Office) on August 29, 2001 submitted AB-006 to meet an Appendix O deliverable stemming from the 2000 AB Corrective Action Plan (procedures needed for safety analysts and nuclear facility personnel). The implied expectation was that LLNL would follow the procedure.
   - Wide-ranging concurrence was obtained from Management in the SEP Directorate, RHWM, NMTP, Plant Engineering, N-Program, and the Engineering Directorate.
   - The letter submitting this procedure along with three other procedures states that an implementation plan (IP) will be developed. However no formal IP was ever completed and the text of AB-006 implies immediate implementation upon approval of the document.
     "This procedure applies to Safety Basis calculations approved after this procedure has become effective." (Section 2.0, AB-006)
   - Training on AB-006 (Course HS8021) was established as an Institutional Training Requirement for all safety analysts and anyone else who does limited scope analyses or calculations for nuclear facilities, i.e., seismic, criticality safety, radiological assessment, wind affects assessment, etc. Over 60 employees had completed the training as of the filing of the NTS report.

2. **Review how requirements for Safety Basis calculations flow down in the institutional DSA process**

   - The requirements establishing the DSA process originate in 10CFR830, which is in the LLNL Work Smart Standards, and flow down to the ES&H Manual Document 51.1.

- Other AB Procedures are referenced in Document 51.1, however there is no direct flow-down from Doc. 51.1 to AB-006.
- AB-006 is referenced in AB-007 and AB-013, which are both referenced in Doc. 51.1
    - AB-007 Control Item Selection Procedure states in Section 5.5: "All calculations deemed necessary to support the CIS process must be documented as approved engineering calculations performed and issued according to the *LLNL Safety Basis Calculation Procedure for Category 2 and 3 Nuclear Facilities* (AB-006) (Ref. 9)."
    - AB-013 Procedure for the Institutional Review and Concurrence of Safety Basis Documents for LLNL Nuclear Hazard Category 2 and 3 Facilities states in Section 2.2: "This review does not fulfill the following: Requirements for independent technical review as described in the Safety Basis Calculation Procedure for Category 2 and 3 Nuclear Facilities"

3. Review the extent to which affected LLNL organizations have explicitly complied with the requirements of Procedure AB-006

Summary

The three LLNL Programs operating nuclear facilities have completed assessments on their compliance with AB-006. A total of 97 calculations were examined. It was found that 31 safety basis calculations referenced in LLNL DSAs that have been completed since August 2001 do either strictly or generally comply with AB-006, although many have minor formatting deficiencies. There were 24 calculations that used alternate formats, and two of those lacked a reviewer signature. There were 42 calculations dated from before August 2001. Of these legacy calculations, 13 were lacking a reviewer signature, and will undergo a technical review per AB-006. See Table 1.

- **NMTP** has 70 safety basis calculations referenced in three DSAs.
    - **B331** has no safety basis calculations referenced in its DSA. See Attachment A.
    - **B334** has 3 legacy calculations that do contain reviewer signatures. See Attachment B.
    - **B239** has 4 calculations. One generally complies with AB-006 but has minor format deficiencies. Three are legacy with reviewer signatures. See Attachment C.
    - **B332** has 63 safety basis calculations. There are 13 calculations that generally comply with AB-006 but have minor format deficiencies. There are 20 calculations that do not follow AB-006 format, but may follow an alternative format (see Section 4). One of these was incomplete and lacked a reviewer signature. There are 30 legacy calculations. Of these, 17 have reviewer signatures. A total of 14 calculations without reviewer signatures were accepted by the Facility Manager on an interim basis, pending completion of

technical reviews per AB-006. See Attachment D. Those reviews were subsequently completed and documented as follows.

- Four calculations dealing with explosion scenarios were reviewed and found to be acceptable. See Attachment E.
- Two calculations dealing with structural loads on the B331 stack were reviewed and found to be acceptable See Attachment F.
- One calculation on tornado and wind hazards was found to have undergone an interdisciplinary peer review as part of its original preparation, and did not require further review. Another document thought to be a calculation was found to be merely an extraction and reporting of data. Therefore, it did not fall under AB-006 and did not require further review. See Attachment G.
- An aircraft accident probability study was reviewed and found to be merely an extraction and reporting of data. Therefore, it did not fall under AB-006 and did not require further review. See Attachment H.
- A decay calculation for nuclear materials was reviewed and found to be acceptable. See Attachment I.
- Documentation was found showing criticality safety memorandum (CSM-954) was reviewed at the time it was originally prepared. See Attachment J.
- Two other criticality safety memoranda (CSM-432 and CSM-670) were determined to not meet the definition of calculations for AB-006 and did not require further review. See Attachment K.
- One incomplete calculation (MESN03-075-OA) concerned equipment that has not yet been installed. The calculation will be properly completed and reviewed prior to system startup. See Attachment H.

- **RHWM** has 19 safety basis calculations referenced in two DSAs.
  - **Waste Storage Facilities** has 16 safety basis calculations. There are 9 calculations that generally comply with AB-006, but have minor format deficiencies. There are 6 legacy calculations; all have reviewer signatures. One calculation does not follow AB-006 and is lacking a reviewer signature; this calculation has been prepared as an AB-006 compliant calculation and was approved by the Facility Manager on October 17, 2006. See Attachment L.
  - **B695 Segment** has 3 safety basis calculations. One complies with AB-006. One is a legacy calculation that does have a reviewer signature. One calculation does not follow AB-006 and is lacking a reviewer signature; this calculation has been prepared as an AB-006 compliant calculation and was approved by the Facility Manager on October 19, 2006. See Attachment M.

- **PATS** has 8 calculations that generally comply with AB-006 but most have minor format deficiencies. See Attachment N.

4. What alternate approaches compare with Procedure AB-006 requirements

The following four formats are examples of alternate approaches used to document safety basis calculations in the current B332 DSA.

- The procedure in the Engineering Directorate for Safety Notes (Mechanical Engineering Safety Notes, Electronics Engineering Safety Notes, or Engineering Directorate Safety Notes) contains guidance for documentation similar to the requirements of AB-006. It also requires signatures of Preparer, Reviewer, and Responsible Manager, and therefore generally meets the intent of AB-006.
  - See Chapter D, Mechanical Engineering, Electronics Engineering, and Engineering Directorate Safety Notes in the Engineering Design Safety Manual, http://engineering-r.llnl.gov/about/pdf/DSSmanual/DSS_Chap_D.pdf and the ES&H Manual Document 42.1 Section 7.0.
- Criticality Safety Memorandums (CSMs) prepared by the Criticality Safety Section in the Hazards Control Department formally document the results of a Criticality Safety Evaluation for use in a DSA. These documents are prepared in accordance with the Criticality Safety Evaluation Procedure (CSG-P-004, May 28, 2004) and are formally reviewed in accordance with the Criticality Safety Section Independent Review Procedure (CSG-P-002, May 28, 2004). The review documentation is filed in the Criticality Safety Section archives, and contains signatures of the Preparer, Reviewer and Responsible manager. These procedures have been used for all CSMs since 1997, and meet the intent of AB-006.
- The NMTP Engineering Note Procedure NMTP-FMP-0201 was compared with AB-006 and found lacking in rigor, although it does have some of the same requirements as AB-006. Specifically, NMTP-FMP-0201 does not have the general requirements for presentation of the document, has different requirements for format, and has different requirements for managerial approval.
- Safety basis calculations prepared by Plant Engineering may contain the information required in AB-006, as well as preparer and reviewer signatures, sometimes with Professional Engineer stamps, but no formal procedure controls their preparation and documentation.

5. How to reconcile Safety Basis calculations that were performed before Procedure AB-006 came into existence (i.e., August 2001)

- AB-006 states that prior calculations must be addressed. *"Safety Basis calculations approved prior to this procedure becoming effective will be appropriately reviewed and approved."* (Section 2.0 AB-006)

- The Response Plan (Reference 3) states how this reconciliation will be approached in the compliance assessments: *"Each of these will be reviewed and listed on a memorandum with the facility manager's (or designee's) signature accepting that calculation for use in the DSA. If any of these calculations are lacking the signature of a technical reviewer, they must also be reviewed for technical content and that review documented per AB-006."* Therefore, legacy calculations were reviewed along with post-AB-006 calculations, although the legacy calculations were not judged on the strict requirements for format and presentation. See Section 3 for a summary of the results.

Extent of Condition Evaluation

The purpose of this extent-of-condition evaluation is to determine how widespread the discovered issue is throughout Laboratory organizations responsible for operating nuclear facilities, and to determine if implementation of AB procedures other than AB-006 has been similarly affected. The following steps constitute the extent of condition review (as appropriate, from ES&H Manual Document 4.7 Section 3.0).

- *"Review the circumstances that led to issue or deficiency identification to determine follow-up for the extent of conditions review."*
  The primary circumstance is the discovery that NMTP was not explicitly following AB-006 for all their safety basis calculations.
- *"Determine activities or facilities to which the issue applies."*
  It applies to the LLNL nuclear facilities managed by NMTP, RHWM and PATS.
- *"Review the results of investigations, critique results, or cause determinations, if applicable or known."*
  LLNL nuclear facility management and nuclear facility personnel believed that their safety basis calculations were acceptable in various formats such as NMTP Engineering Notes, Engineering Safety Notes, Criticality Safety Memos, or Plant Engineering calculations. The lack of explicit flow-down from Document 51.1 directly to AB-006 further compounded the confusion on requirements.
- *"Develop a line of inquiry or checklist based on the results of the circumstance review and the conditions described in the issue."*
  This is not needed.
- *"Using responses to the line of inquiry or checklist, identify the extent of applicability to other activities, processes, equipment, programs, facilities, operations, and organizations."*
  This only applies to those organizations managing nuclear facilities, NMTP, RHWM, and PATS.
- *"Document the results of the extent of condition evaluation in the ITS. Documentation may also be appropriate in a stand-alone report."*
  The ITS Action ID is 20931.1.31. This document forms the stand-alone report on this issue.
- *"Obtain Responsible Manager and SME concurrence of the extent of conditions report, if required."*

See the concurrence list on the cover page.

6. **A determination if implementation of AB procedures other than AB-006 has been similarly affected**
   - An effectiveness review of the implementation of the other AB procedures has not been conducted, except for the USQ Procedure (Reference 4.) However, a general evaluation of the compliance with AB procedures for safety basis documents being submitted to LSO is part of the institutional review conducted before LLNL approval of each document. There is no indication that the implementation of AB procedures other than AB-006 has been similarly affected.
   - Other procedures are invoked in Document 51.1 as follows.
     - **AB-003** - "The safety basis development process explained here indicates how the level of formality is related to the level of hazard through the *LLNL Graded Approach Procedure* (AB-003)." ... "The LLNL Graded Approach Procedure (AB-003) has its most direct effect in Phase VI."
     - **AB-004** - "Phase II of DSA development is a hazard evaluation, the second step of hazard analysis [see *LLNL Hazard Analysis Procedure* (AB-004)]"
     - **AB-005** - "Phase III of DSA development is the performance of an accident analysis [see *LLNL Accident Analysis Procedure* (AB-005)]."
     - **AB-007** - "During Phase IV of DSA development, safety SSCs are selected from the pool of candidates forwarded from hazard and accident analysis [see *LLNL Control Item Selection Procedure* (AB-007)]."
     - **AB-008** - "The controls are defined in terms of TSR Limiting Conditions for Operation and TSR Administrative Controls. The Administrative Controls section is augmented, as necessary, with major safety management programs. The format and content is dictated by *LLNL TSR Development Procedure* (AB-008)."
     - **AB-013** - "Subsequently, the Authorization Basis (AB) Section Leader, or other designated individual, shall perform an Institutional Concurrence review per AB-013 on the DSA and TSR for the Deputy Director for Operations (DDO)."
   - The following relatively new (approved 11/08/05) AB Procedure is not directly invoked in Doc. 51.1.
     - AB-011, Technical Safety Requirements Implementation Procedure For Hazard Category 2 and 3 Nuclear Facilities

References:

1) Noncompliance Report NTS-OAK-LLNL-LLNL-2005-0010, "Failure to Implement Institutional Commitment Concerning Documentation of Safety Basis Calculations," May 31, 2005

2) Memorandum from Garry Holman to Howard Wong, "Past Due Corrective Actions for PAAA Noncompliance Tracking System Report," January 12, 2006.
3) Memorandum from Thomas Altenbach to Garry Holman, "NTS-OAK-LLNL-LLNL-2005-0010 Response Plan", August 8, 2006
4) Mark Mitchell, "USQ (OA-40 CAP) Effectiveness Review Report," February 28, 2006.

Attachments:

A. Memorandum from Mark Mintz, B331 Facility Manager, to Mark Martinez, NMT Program Leader, "Acceptance of Safety Basis Calculations for Building 331 (B331)," TK06-025, October 5, 2006
B. Memorandum from Chris Holm, B334 Facility Manager (Acting), to Mark Martinez, NMT Program Leader, "Acceptance of Safety Basis Calculations for Building 334 (B334)," SBK06-286, October 9, 2006
C. Memorandum from Chris Holm, B239 Facility Manager (Acting), to Mark Martinez, NMT Program Leader, "Acceptance of Safety Basis Calculations for Building 239 (B239)," SBK06-285, October 9, 2006
D. Memorandum from Roger Rocha, B332 Facility Manager, to Mark Martinez, NMT Program Leader, "Acceptance of Safety Basis Calculations for Building 332 (B332)," PU06-124, October 19, 2006.
E. Memorandum from Madhu Kamath to Roger Rocha, "B332: Peer Review of Pre-AB006 Safety Basis Calculations," PCAS-332-2006-025, November 7, 2006.
F. Memorandum from Madhu Kamath to Roger Rocha, "B332: Peer Review of Pre-AB006 Safety Basis Calculations," PCAS-332-2006-026, November 7, 2006.
G. Memorandum from Madhu Kamath to Roger Rocha, "B332: Peer Review of Pre-AB006 Safety Basis Calculations," PCAS-332-2006-027, November 7, 2006.
H. Memorandum from Roger Rocha, Plutonium Facility Manager, to Mark W. Martinez, NMT Program Leader, "Acceptance of Safety Basis Calculations for Building 332 (B332)," PU06-145, November 29, 2006.
I. Memorandum from Greg Jones to Roger Rocha, "Verification of Decay Corrections for Fuel Grade Pu Mixture," HC-TI-06-172, October 9, 2006.
J. Criticality Safety Record of Independent Review, RIR 98-47, April 9, 1998.
K. Memorandum from John Scorby to Richard Ragaini, "Criticality Safety Section Independent Review of CSM432 and CSM670," CSAM 06-172, November 7, 2006.
L. Memorandum from Kerry Cadwell, Facility Manager of the Waste Storage Facilities, to Stephanie Goodwin, "Acceptance of Safety Basis Calculations for RHWM Waste Storage Facilities," September 25, 2006
M. Memorandum from John Bowers, Facility Manager of the B695 Segment of the DWTF, "Acceptance of Safety Basis Calculations for B695 Segment of the DWTF," September 25, 2006
N. Memorandum from Dennis Barrett to William A. Bookless, "Acceptance of the Safety Basis Calculations for the Nuclear Materials Transportation Safety Manual (TSD)", SEP-1260, November 16, 2006.

Table 1. Assessment Results

	Strictly Compliant	Generally Compliant	Alternate Format	Legacy with Review	Legacy without Review	Total
NMTP – B239	0	1	0	3	0	4
NMTP – B331	0	0	0	0	0	0
NMTP – B332	0	13	20♠	17	13♥	63
NMTP – B334	0	0	0	3	0	3
RHWM – Waste Storage Facilities	0	9	1♣	6	0	16
RHWM – B695 Segment of the DWTF	1	0	1♣	1	0	3
PATS	1	7	0	0	0	8
Total	2	30	22	30	13	97

♠ One calculation is incomplete, lacking all signatures. It concerns equipment that has not been installed. The calculation will be properly completed and reviewed before system startup.

♥ Technical reviews per AB-006 or other dispositions have been completed.

♣ Identical calculation is in both RHWM safety bases, lacking reviewer, but has been redone per AB-006.

Interdepartmental letterhead

Mail Station: L-358

Ext: 2-8394

Defense and Nuclear Technologies
Nuclear Materials Technology Program

October 5, 2006
TF06-025 JMM/mf

TO: Mark Martinez, NMT Program Leader

FROM: Mark Mintz, B331 Facility Manager

SUBJECT: Acceptance of Safety Basis Calculations for Building 331 (B331)

This memorandum satisfies Action 2 of the NTS-OAK-LLNL-LLNL-2005-0010 Response Plan, which requires facility managers (or designee) to document acceptance of safety basis calculations that do not strictly follow Authorization Basis procedure AB-006, "Safety Basis Calculation Procedure for Category 2 and 3 Nuclear Facilities for use in the Documented Safety Analysis" for use in the Documented Safety Analysis (DSA).

B331 is designated a Category 3 nuclear facility. The event consequences have been determined qualitatively. Therefore, B331 does not have any safety basis calculations.

Mark Mintz
B331 Facility Manager

cc:

Altenbach, Tom	L-375
Chin, Desmond	L-372
Foote, Ken	L-372
Palmrose, Don	L-375
Pinkston, Dave	L-375
Ragaini, Richard	L-372
Spencer, Diane	L-372
Voss, Keith	L-372

ATTACHMENT A

Interdepartmental letterhead

Defense and Nuclear Technologies
Nuclear Materials Technology Program

Mail Station: L-358

Ext: 3-3066

October 9, 2006
SBK06-286 CJH/mf

TO: Mark Martinez, NMT Program Leader

FROM: Chris Holm, B334 Facility Manager (Acting)

SUBJECT: Acceptance of Safety Basis Calculations for Building 334 (B334)

This memorandum satisfies Action 2 of the NTS-OAK-LLNL-LLNL-2005-0010 Response Plan, which requires facility managers (or designee) to document acceptance of safety basis calculations that do not strictly follow Authorization Basis procedure AB-006, "Safety Basis Calculation Procedure for Category 2 and 3 Nuclear Facilities for use in the Documented Safety Analysis" for use in the Documented Safety Analysis (DSA).

Attachment 1 lists the B334 safety basis calculations and identifies those that do not strictly follow AB-006. I accept the identified calculations for use in the B334 DSA.

Chris Holm
B334 Facility Manager (Acting)

Attachments:
1. B334 safety basis calculations
2. Explanation of codes

cc w/attachments:

Altenbach, Tom	L-375
Chin, Desmond	L-372
Foote, Ken	L-372
Mullen, Charles	L-372
Palmrose, Don	L-375
Pinkston, Dave	L-375
Ragaini, Richard	L-372
Voss, Keith	L-372

ATTACHMENT B

Attachment 1: B334 safety basis calculations

Calculation Number or DSA Reference	Approval Date	Title	Strictly follows requirements of AB-006 (Y/N/NA)	Reviewer Approved (Y/N)	List code of requirement(s) not met. (See attachment 2 for code explanation)
Chapter 2, Ref. 7	2/7/2000	Structural calculations for the installation of new concrete shielding walls for B334	N	Y	Prepared before implementation of AB-006.
Chapter 7, Ref. 5	4/21/2000	B334 Shielding/dose rate calculations	N	Y	Prepared before implementation of AB-006.
HC/AB-2001-214	7/11/2001	Hazard analysis of hydraulic fluid in shaker table, B334	N	Y	Not prepared in AB-006 format (P5, P6, C1, C5, C6, C7, R1, R3, R4)

Attachment 2: Explanation of codes

Calculation Title				
Calculation Number	Date Calculation Approved			
Strictly meets AB-006 requirements, including named section titles:		Y	N	N/A
Preparer Actions				
P1	Sequential sheet number on each sheet			
P2	Total number of sheets on each sheet			
P3	Unique calculation number on each sheet			
P4	Revision identified on each sheet			
P5	Calculation Cover Sheet Attached and preparer sections filled in			
P6	Security Classification determined and document is appropriately marked			
Calculation Body				
C1	Table of contents (required if calculation contains attachments or appendices)			
C2	Revision Description (Optional)			
C3	Open Items (required for preliminary calculations)			
C4	References (required if references are key to the calculation)			
C5	Input (required for all calculations)			
C6	Analytical Methods and Computations (required for all calculations)			
C7	Results (required for all calculations)			
C8	Conclusion (required for all calculations)			
C9	Attachments and appendices (optional)			
Review and approval				
R1	Review method listed on Calculation Cover Sheet			
R2	Reviewer signed and dated calculation			
R3	Responsible Manager signed and dated calculation			
R4	Facility Manager signed and dated calculation			
Calculation by Others (subcontractors to LLNL)				
S1	Cover sheet prepared			
Comments				

Interdepartmental letterhead

Defense and Nuclear Technologies
Nuclear Materials Technology Program

Mail Station: L-358

Ext: 3-3066

October 9, 2006
SBK06-285 CJH/mf

TO: Mark Martinez, NMT Program Leader

FROM: Chris Holm, B239 Facility Manager (Acting)

SUBJECT: Acceptance of Safety Basis Calculations for Building 239 (B239)

This memorandum satisfies Action 2 of the NTS-OAK-LLNL-LLNL-2005-0010 Response Plan, which requires facility managers (or designee) to document acceptance of safety basis calculations that do not strictly follow Authorization Basis procedure AB-006, "Safety Basis Calculation Procedure for Category 2 and 3 Nuclear Facilities for use in the Documented Safety Analysis" for use in the Documented Safety Analysis (DSA).

Attachment 1 lists the B239 safety basis calculations and identifies those that do not strictly follow AB-006. I accept the identified calculations for use in the B239 DSA.

Chris Holm
B239 Facility Manager (Acting)

Attachments:
1. B239 safety basis calculations
2. Explanation of codes

cc w/attachments:

Altenbach, Tom	L-375
Bates, Stephanie	L-372
Chin, Desmond	L-372
Foote, Ken	L-372
Palmrose, Don	L-375
Pinkston, Dave	L-375
Ragaini, Richard	L-372
Voss, Keith	L-372

ATTACHMENT C

Attachment 1: B239 safety basis calculations

Calculation Number or DSA Reference	Approval Date	Title	Strictly follows requirements of AB-006 (Y/N/NA)	Reviewer Approved (Y/N)	List code of requirement(s) not met. (See attachment 2 for code explanation)
DSA Chapter 2, Ref 3	3/13/2000	*Seismic evaluation report B239* – Degenkolb Engineers Job Number A00059.00.002	NA	Y	Prepared before implementation of AB-006. Calculation by others.
DSA Chapter 2, Ref 4	6/6/2000	B-239 radiography building, room B11, 9-Mev test cell; evaluate seismic performance of existing 5 ton crane	NA	Y	Prepared before implementation of AB-006.
DSA Chapter 3, Ref 36	9/15/2000	Dose conversion factors for 30-yr weapons grade Pu mixture	NA	Y	Prepared before implementation of AB-006.
HC/AB-B239-0205	3/1/2002	B239 Criticality fault tree analysis	N	Y	Prepared as AB-006 calculation. Lacked security classification P6.

Attachment 2: Explanation of codes

Calculation Title				
Calculation Number	Date Calculation Approved			
Strictly meets AB-006 requirements, including named section titles:		Y	N	N/A
Preparer Actions				
P1	Sequential sheet number on each sheet			
P2	Total number of sheets on each sheet			
P3	Unique calculation number on each sheet			
P4	Revision identified on each sheet			
P5	Calculation Cover Sheet Attached and preparer sections filled in			
P6	Security Classification determined and document is appropriately marked			
Calculation Body				
C1	Table of contents (required if calculation contains attachments or appendices)			
C2	Revision Description (Optional)			
C3	Open Items (required for preliminary calculations)			
C4	References (required if references are key to the calculation)			
C5	Input (required for all calculations)			
C6	Analytical Methods and Computations (required for all calculations)			
C7	Results (required for all calculations)			
C8	Conclusion (required for all calculations)			
C9	Attachments and appendices (optional)			
Review and approval				
R1	Review method listed on Calculation Cover Sheet			
R2	Reviewer signed and dated calculation			
R3	Responsible Manager signed and dated calculation			
R4	Facility Manager signed and dated calculation			
Calculation by Others (subcontractors to LLNL)				
S1	Cover sheet prepared			
Comments				

Lawrence Livermore National Laboratory

Interdepartmental letterhead

Defense and Nuclear Technologies
Nuclear Materials Technology Program

Mail Station: L-360

Ext: 3-1743

October 19, 2006
PU06-124 RRR/me

TO: Mark Martinez, NMT Program Leader

FROM: Roger Rocha, B332 Facility Manager

SUBJECT: Acceptance of Safety Basis Calculations for Building 332 (B332)

This memorandum satisfies Action 2 of the NTS-OAK-LLNL-LLNL-2005-0010 Response Plan, which requires facility managers (or designee) to document acceptance of safety basis calculations that do not strictly follow Authorization Basis procedure AB-006, "Safety Basis Calculation Procedure for Category 2 and 3 Nuclear Facilities for use in the Documented Safety Analysis" for use in the Documented Safety Analysis (DSA).

Attachment 1 lists the B332 safety basis calculations and identifies those that do not strictly follow AB-006, but have been verified to have had a technical review. I accept the calculations identified in Attachment 1 for use in the B332 DSA.

Attachment 2 identifies the calculations for which the independent review could not be located during this assessment. An informal review, performed as part of this assessment, of the calculations did not raise any questions concerning the validity of the calculation results. The informal review will be followed with an appropriate subject matter expert review. As required by NTS-OAK-LLNL-LLNL-2005-0010 Response Plan, the review of these calculations will be formally documented per AB-006 and the Facility Manager acceptance of these calculations will be documented through the established AB-006 process. I accept these calculations on an interim basis pending completion of the appropriate SME review.

Roger Rocha
B332 Facility Manager

ATTACHMENT D

Attachments:
1. B332 safety basis calculations with independent review
2. B332 safety basis calculations without confirmed independent review
3. Explanation of codes

cc w/attachments:

Altenbach, Tom	L-375
Chin, Desmond	L-372
Foote, Ken	L-372
Palmrose, Don	L-375
Pinkston, Dave	L-375
Ragaini, Richard	L-372
Voss, Keith	L-372

Attachment 1: B332 safety basis calculations with independent review

Calculation Number or DSA Reference	Approval Date	Title	Strictly follows requirements of AB-006 (Y/N/NA)	Reviewer Approved (Y/N)	List code of requirement(s) not met. (See attachment 3 for code explanation)
Chapter 1 Ref 43	1/17/2000	Engineering calculations, overhead entanglement/deterrent system with netting	N/A	Y	Prepared before implementation of AB-006.
PCAS 332-2002-006	6/24/2002	Structural calculations for the fire sprinkler water covers for the MCCs in room 1200	N	Y	Not prepared in AB-006 format (P5,P6,C1, C5, C6, C7, C8, R1,R4)
Chapter 2 Ref 14	6/24/1992	Seismic and wind evaluation of B332	N/A	Y	Prepared before implementation of AB-006.
Chapter 2 Ref 16	7/17/1989	Hazard evaluations of critical systems in the Pu facility	N/A	Y	Prepared before implementation of AB-006.
Chapter 2 Ref 17	8/1/1996	Plutonium facility - B332 seismic assessment report	N/A	Y	Prepared before implementation of AB-006.
Chapter 2 Ref 18	9/7/1979	Modification, plenum duct support – lateral resistant design	N/A	Y	Prepared before implementation of AB-006.
Chapter 2 Ref 21	3/1/1982	Seismic evaluation of the LLNL B332	N/A	Y	Prepared before implementation of AB-006.
HC/AB-B332-0307 Rev 0	7/16/2003	Building 332 accidents involving the release of radioactivity	N	Y	Prepared as AB-006 calculation. Lacked security classification P6.
HC/AB-B332-0301	2/27/2003	Evaluation of the damage potential from small amounts of flammable solvents used in a glovebox	N	Y	Prepared as AB-006 calculation. Lacked security classification P6. Lacked section heading for C5, but contained appropriate technical content.

Calculation Number or DSA Reference	Approval Date	Title	Strictly follows requirements of AB-006 (Y/N/NA)	Reviewer Approved (Y/N)	List code of requirement(s) not met. (See attachment 3 for code explanation)
HC/AB-B332-0315	10/13/2003	Evaluation of a postulated natural gas leak external to room 1200	Y	Y	Prepared as AB-006 calculation. Lacked section heading for C5, but contained appropriate technical content.
HC/AB-B332-0314 Rev 0	10/13/2003	Analysis of molten Pu spill Rev 0	Y	Y	Prepared as AB-006 calculation. Lacked section heading for C5, but contained appropriate technical content.
HC/AB-B332-0304	7/28/2003	Leak path factors for B332 accident analyses	N	Y	Prepared as AB-006 calculation. Lacked security classification P6. Lacked section heading for C5, but contained appropriate technical content.
Chapter 3 Ref 32	10/2/2003	Leak path factor studies for Building 332, the Pu building, using CONTAIN 2.0	N	Y	Calculation by others. Not prepared in AB-006 format (P5, P6, C5, C6, R1, R4, S1)
HC/AB-B332-0311	12/4/2003	Equivalent mass multipliers using ICRP-72 DCF values	N	Y	Prepared as AB-006 calculation. Lacked security classification P6.
HC/AB-B332-0308	8/11/2003	Building 332 doses resulting from an accidental criticality	N	Y	Prepared as AB-006 calculation. Lacked security classification P6.
EN02-332-001	10/8/2002	Reliability of B332 firewater sources	N	Y	Not prepared in AB-006 format (P5, C1, C5, C6, R1)
EN02-332-002	10/8/2002	B332 Firewater sources safety basis	N	Y	Not prepared in AB-006 format (P5, C5, C6, R1)

Calculation Number or DSA Reference	Approval Date	Title	Strictly follows requirements of AB-006 (Y/N/NA)	Reviewer Approved (Y/N)	List code of requirement(s) not met. (See attachment 3 for code explanation)
HC/AB-B332-0306	7/16/2003	Pu hydride airborne release fractions (ARF) and respirable fractions (RF) for accident analysis	N	Y	Prepared as AB-006 calculation. Lacked security classification P6. Lacked table of contents (C1) and section headings for C5, C6 and C7, but contained appropriate technical content.
Chapter 3 Ref 67	11/16/88	Assessment of SAR, worker and contamination impacts of handling unencapsulated non-dispersible Pu in a fume hood	N/A	Y	Prepared before implementation of AB-006.
HC/AB-B332-0309	10/6/2003	B332 doses resulting from an accident involving a spill of PuO_2 powder and handing of unencapsulated nondispersible Pu outside engineered safety features	N	Y	Prepared as AB-006 calculation. Lacked security classification P6. Lacked review method R1.
CSM-989	6/20/1998	Technical bases for standardized critical safety controls for Building 332 condition 4	N/A	Y	Prepared before implementation of AB-006.
CSM-1001	8/14/1998	Technical bases for condition 1 mass limits	N/A	Y	Prepared before implementation of AB-006.
CSM-1066	12/17/1998	Analysis for SCCC 5 and SCCC P	N/A	Y	Prepared before implementation of AB-006.
CSM-1265	10/16/2002	Criticality safety evaluation of ISM super diamond safe for fissile material storage (U)	N	Y	Not prepared in AB-006 format (P2, P5, C1, C5, C6, R1, R2, R3, R4)
ENE 90-950B	9/25/2002	MPL - Chlorination gas cabinet & piping system	N	Y	Not prepared in AB-006 format (P5, P6, C5, C6, C7, C8, R1, R4)

Calculation Number or DSA Reference	Approval Date	Title	Strictly follows requirements of AB-006 (Y/N/NA)	Reviewer Approved (Y/N)	List code of requirement(s) not met. (See attachment 3 for code explanation)
HC/AB-B332-0310	11/19/2003	B332 Accidents involving the release of toxic gases	N	Y	Prepared as AB-006 calculation. Lacked security classification P6. Lacked review method R1.
Chapter 3 Ref 91	7/8/2003	Fault tree analysis of potential hydrogen explosion and hydrogen fire hazard in the MPL, SPL, and the MCL	N	Y	Calculation by others. Not prepared in AB-006 format (P5, P6, C1, C5, C6, R1, R4, S1)
HC/AB-B332-0303	6/26/2003	Conservative evaluation of the TNT equivalence from a deflagration or explosion of hydrogen gas	N	Y	Prepared as AB-006 calculation. Lacked security classification P6. Lacked table of contents C1. Lacked review method R1.
PCAS 332-2005-003	5/27/2005	Structural calculations for the B332 waste accumulation area	N	Y	Not prepared in AB-006 format (P5, P6, C5, C6, C7, C8, R1, R4)
Chapter 3 Ref 104	10/10/2003	Seismic evaluation of the hydrogen line in the basement of Increment III	N	Y	Not prepared in AB-006 format (P2, P5, P6, R1, R4, C5, C6, C7)
HC/AB-B332-0601	1/28/2006	Phase II seismic anchorage of cubicles structural calculations	N	Y	Calculation by others. Prepared as AB-006 calculation. Lacked section headings for C5, C6, C7 and C8, but contained appropriate technical content.
Chapter 3 Ref 106	2/8/2006	Seismic qualification of 3 storage cubicles Rev 1	N	Y	Calculation by others. Not prepared in AB-006 format (P5,P6,C5,C6,C7,C8, R1, R4, S1)
Chapter 3 Ref 109	6/14/2002	Transmittal of detailed aircraft crash probability analysis for Building 332Rev 1	N	Y	Not prepared in AB-006 format (P2, P5, C5, C6, C7, R1, R3, R4)

Calculation Number or DSA Reference	Approval Date	Title	Strictly follows requirements of AB-006 (Y/N/NA)	Reviewer Approved (Y/N)	List code of requirement(s) not met. (See attachment 3 for code explanation)
Chapter 3 Ref 110	11/4/2000	Aircraft crash analysis into LLNL B332 in accordance with DOE-STD-3014-96 using 1999 data	N/A	Y	Prepared before implementation of AB-006.
PCAS332-2000-010	10/6/2000	Structural calculations for the global wall collapse of Increment I exterior concrete wall panel subjected to accidental aircraft crash Rev 1	N/A	Y	Prepared before implementation of AB-006.
Chapter 3 Ref 119	7/1/2001	Finite element analysis of concrete wall panel subjected to missile impact: a study conducted for the hazards control authorization basis section	N	Y	Not prepared in AB-006 format (P2, P5-6, C2, C5, C6, R1,R3, R4)
HC/AB-B332-0313	11/7/2003	Consequence to B332 from HCN release from B322	N	Y	Prepared as AB-006 calculation. Lacked security classification P6. Lacked review method R1.
PCAS 332-2005-002	4/4/2005	Structural calculations for the B332 safety class zone for safety class slabs	N	Y	Not prepared in AB-006 format (P5, P6, C5, C6, C7, C8, R1, R4)
PCAS 332-2005-014	12/7/2005	Structural calculations for the B332 safety significant zone for safety class slabs	N	Y	Not prepared in AB-006 format (P5, P6, C5, C6, C7, C8, R1, R4)
EN03-332-021	12/23/2003	Engineering evaluation of B332 demisters	N	Y	Not prepared in AB-006 format (P5, C1, C5, C6, C7, R1, R4)
EN04-332-029	10/29/2004	Documentation of the dynamic thermal analysis of Increment I room ventilation system during an evaluation basis fire	N	Y	Not prepared in AB-006 format (P1, P2, P5, C5, C6, R1, R4)

Calculation Number or DSA Reference	Approval Date	Title	Strictly follows requirements of AB-006 (Y/N/NA)	Reviewer Approved (Y/N)	List code of requirement(s) not met. (See attachment 3 for code explanation)
EN05-332-009	9/30/2005	Evaluation of Increment III GBES high temperature switches	N	Y	Not prepared in AB-006 format (P5, C5, C6, C7, R1, R4)
MESN03-049-AA	9/1/2003	Seismic calculations for the radiography vault in B332	N	Y	Not prepared in AB-006 format (P5, P6, C5, C6, C7, R1, R3, R4)
MESN97-060-OA	11/3/1997	Hydrogen gas supply system for hydriding in glovebox No. 7	N/A	Y	Prepared before implementation of AB-006.
Chapter 4 Ref 46	3/1/1998	Design and documentation guide for toxic gas handling manifolds and gas cabinets	N/A	Y	Prepared before implementation of AB-006.
CSM-1264	7/8/2002	Criticality alarm head coverage of safes	N	Y	Not prepared in AB-006 format (P2, P5, C1, R1, R2, R3, R4)
EN03-332-022	10/2/2003	Engineering evaluation of seismic mounting for emergency battery lights	N	Y	Not prepared in AB-006 format (P5, C1, C5, C6, C7, R1, R4)
CSM-1137	9/23/1999	Evaluation of the maximum credible criticality accident in B332	N/A	Y	Prepared before implementation of AB-006.
CSM-960	2/3/1998	Comparative risk analysis for fire fighting guidelines for B332	N/A	Y	Prepared before implementation of AB-006.

Attachment 2: B332 safety basis calculations without confirmed independent review

Calculation Number or DSA Reference	Approval Date	Title	Strictly follows requirements of AB-006 (Y/N/NA)	Reviewer Approved (Y/N)	List code of requirement(s) not met. (See attachment 3 for code explanation)
Chapter 2 Ref 26	10/1/1982	*Assessment of tornado and straight wind hazard probabilities at LBL, SLA, LLNL and SNLL* – McDonald, Mehta and Minor Consulting Engineers	N/A	N	Prepared before implementation of AB-006.
Chapter 2 Ref 27	1/1/1980	*Tornado and high wind hazards at LLNL* – T. Theodore Fujita	N/A	N	Prepared before implementation of AB-006.
Chapter 3 Ref 45	7/20/2000	Calculation of fuel-grade mixture – 30-year decay	N/A	N	Prepared before implementation of AB-006.
CSM-954	4/17/1998	Criticality safety analysis for OSP332.84 conditions 2 and 3	N/A	N	Prepared before implementation of AB-006.
CSM-432	1/21/1992	Maximum credible yields of potential nuclear excursions in B332	N/A	N	Prepared before implementation of AB-006.
CSM-670	5/27/1994	Maximum credible yields of excursions involving uranium systems in B332	N/A	N	Prepared before implementation of AB-006.
Chapter 3 Ref 96	9/26/1984	*Blast effects calculations, room 1010, B332* – Engineering Calculations, C. Y. King	N/A	N	Prepared before implementation of AB-006.
Chapter 3 Ref 97	11/16/1988	*Explosion analysis, B332 room 1010 (MPL) & room 1009 (EDS)* – Engineering Calculations, C. Y. King	N/A	N	Prepared before implementation of AB-006.

Calculation Number or DSA Reference	Approval Date	Title	Strictly follows requirements of AB-006 (Y/N/NA)	Reviewer Approved (Y/N)	List code of requirement(s) not met. (See attachment 3 for code explanation)
Chapter 3 Ref 98	10/31/1996	*Blast effects of hypothetical explosion in Increment I, B332, LLNL* – Engineering Note, C. Y. King	N/A	N	Prepared before implementation of AB-006.
Chapter 3 Ref 99	9/191996	*Glovebox duct internal pressure capability* – Memo to H. Woo, PES 96-141, Y. Chang	N/A	N	Prepared before implementation of AB-006.
Chapter 3 Ref 113	12/1/1994	Aircraft accident probability study for the LLNL B332	N/A	N	Prepared before implementation of AB-006.
Chapter 3 Ref 123	12/7/1993	*Evaluation of B332 stack for seismic and wind load* – Memo to J. A. Carlsen, Y. Chang	N/A	N	Prepared before implementation of AB-006.
Chapter 3 Ref 124	7/20/1978	*Structural calculations for additional support of 30 meter stacks (B331 complex)* – Holmes & Narver, Inc. J/R 331-528	N/A	N	Prepared before implementation of AB-006.
MESN03-075-OA	7/21/2004	Gaseous hydrogen piping system for GB No. 7 and the metal conversion glovebox	N	N	Not prepared in AB-006 format (P5, P6, C5, C6, C7, R1, R2, R3, R4). Equipment not yet installed. Will follow appropriate process for startup. This calculation will be properly completed and reviewed prior to system startup

Attachment 3: Explanation of codes

Calculation Title				
Calculation Number	Date Calculation Approved			
Strictly meets AB-006 requirements, including named section titles:		Y	N	N/A
Preparer Actions				
P1	Sequential sheet number on each sheet			
P2	Total number of sheets on each sheet			
P3	Unique calculation number on each sheet			
P4	Revision identified on each sheet			
P5	Calculation Cover Sheet Attached and preparer sections filled in			
P6	Security Classification determined and document is appropriately marked			
Calculation Body				
C1	Table of contents (required if calculation contains attachments or appendices)			
C2	Revision Description (Optional)			
C3	Open Items (required for preliminary calculations)			
C4	References (required if references are key to the calculation)			
C5	Input (required for all calculations)			
C6	Analytical Methods and Computations (required for all calculations)			
C7	Results (required for all calculations)			
C8	Conclusion (required for all calculations)			
C9	Attachments and appendices (optional)			
Review and approval				
R1	Review method listed on Calculation Cover Sheet			
R2	Reviewer signed and dated calculation			
R3	Responsible Manager signed and dated calculation			
R4	Facility Manager signed and dated calculation			
Calculation by Others (subcontractors to LLNL)				
S1	Cover sheet prepared			
Comments				

PCAS-332-2006-025

Design and Construction Division
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PLANT ENGINEERING
Success through superior service

November 7, 2006

To: Roger Rocha

From: Madhu Kamath

Subject: B332: Peer Review of Pre-AB006 Safety Basis Calculations

The following calculations have been appropriately reviewed and approved using the document review method provided in Section 5.5.3 of document AB006. Various elements such as selection of inputs, assumptions, reasonable descriptions, engineering judgment of the authors, appropriate analytical methods, mathematical checks, and incorporation of inputs into the engineering documents were addressed in the review.

(96)* King, C. Y. Blast Effects Calculations, Rm 1010, B332, Engineering Calculations, Lawrence Livermore National Laboratory, Livermore, CA (September 1984)

(97)* King C. Y., Explosion Analysis, Building 332, Rm 1010 (MPL & Rm 1009 EDS), Engineering Calculations, Lawrence Livermore National Laboratory, (Livermore, CA November 16, 1988).

(98)* Blast Effects of Hypothetical Explosion in Increment I, Building 332, LLNL by C. Y. King October 1996. The glovebox plexiglass was analyzed as a ductile material in flexure. This not an appropriate assumption. The DSA assumes that the plexiglass fails for the event of concern. However, the calculated performance of the glovebox plexiglass was not incorporated in the B332 DSA, so further study is not warranted.

(99)* Memo from Chang, Y. to H. Woo, Re: Glovebox Duct Internal Pressure Capability, Lawrence Livermore National Laboratory, Livermore, CA PES 96-141 (September 19, 1996)

I verify that the calculations in all of the above references are adequate to support the relevant conclusions, as specified in the B332 DSA.

*Numbers in parentheses indicate corresponding reference numbers in the B332 DSA.

SSmkW345mib
SS006
11/07/06

ATTACHMENT Z

Madhu Kamath

Madhu Kamath, Ph.D., S.E.
Building 332 Systems Engineer/Principal
Structural Engineer
Design and Construction Division

cc: Desmond Chin L-372
David Coats L-654
Ken Foote L-372
Brad Olson L-360
Barb Quivey L-654
Stan Tuholski L-654
Keith Voss L-372

SSmkW345mib
SS006
11/07/06

PCAS-332-2006-026

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PLANT ENGINEERING
Success through superior service

November 7, 2006

To: Roger Rocha

From: Madhu Kamath

Subject: B332: AB006 Peer Review of Pre-AB006 Safety Basis Calculations

The following calculations have been appropriately reviewed and approved using the document review method provided in Section 5.5.3 of document AB006. Various elements such as selection of inputs, assumptions, reasonable descriptions, engineering judgment of the authors, appropriate analytical methods, mathematical checks, and incorporation of inputs into the engineering documents were addressed in the review.

(124)* Structural Calculations for Additional Support of 30 Meter Stacks (Building 331 Complex) – Holmes and Narver, Inc. Mercury, Nevada, July 20, 1978

(123)* LLNL (1993), "Evaluation of Building 331 Stack for Seismic and Wind Load," Lawrence Livermore National Laboratory, Livermore, California (December 1993)

I verify that the calculations in all of the above references are adequate to support the relevant conclusions, as specified in the B332 DSA.

*Numbers in parentheses indicate corresponding reference numbers in the B332 DSA.

Madhu Kamath

Madhu Kamath, Ph. D, S. E.
Building 332 Systems Engineer/Principal Structural Engineer
Design and Construction Division

SSmkW346mib
SS007
11/07/06

ATTACHMENT F

cc: Desmond Chin L-372
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11/07/06

PCAS-332-2006-027

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PLANT ENGINEERING
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November 7, 2006

To: Roger Rocha

From: Madhu Kamath

Subject: B332: AB006 Peer Review of Pre-AB006 Safety Basis Documents

The following documents have been referenced in the B332 DSA. These documents contain history of charts wind/tornado speeds, frequency of occurrences, tables, and charts using recognized methods. The DSA uses these documents to form the technical basis for the wind assessment in the DSA. During preparation of Reference 26, the document underwent interdisciplinary review (by DOE Headquarters and site offices, NOAA, and NRC) and the appropriate comments incorporated. Reference 26 has been appropriately reviewed during its preparation.

Reference 27 provides a chart for use in the DSA. AB006 states "the process of extracting data from tables or graphs is not considered a calculation." Therefore, in accordance with AB006, Reference 27 is not considered a safety basis calculation and the review and approval in accordance with AB006 is not applicable.

(27)* Tornado and High-Wind Hazards at Livermore Laboratory, California by T. Theodore Fujita Task No. 4, 1980

(26)* Assessment of Tornado and Straight Wind Hazard Probabilities at the Lawrence Berkeley Laboratory, Stanford Linear Accelerator and Livermore/Sandia Laboratories by James R. McDonald, P. E. October 1982

* Numbers in parentheses indicate corresponding reference numbers in the B332 DSA.

Madhu Kamath

Madhu Kamath, Ph. D, S. E.
Building 332 Systems Engineer/Principal Structural Engineer
Design and Construction Division

SSmkW347mib
SS008
11/07/06

ATTACHMENT G

cc: Desmond Chin L-372
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Brad Olson L-360
Barb Quivey L-654
Stan Tuholski L-654
Keith Voss L-372

SSmkW347mib
SS008
11/07/06

Lawrence Livermore National Laboratory

Interdepartmental letterhead

Defense and Nuclear Technologies
Nuclear Materials Technology Program

Mail Station: L-360

Ext: 3-1743

November 29, 2006
PUO06-145 RRR/me

TO: Mark W. Martinez, NMT Program Leader

FROM: Roger R. Rocha, Plutonium Facility Manager

SUBJECT: Acceptance of Safety Basis Calculations for Building 332 (B332)

This memorandum completes Action 2 of the NTS-OAK-LLNL-LLNL-2005-0010 Response Plan, which requires facility managers (or designee) to document acceptance of safety basis calculations that do not strictly follow Authorization Basis procedure AB-006, "Safety Basis Calculation Procedure for Category 2 and 3 Nuclear Facilities for use in the Documented Safety Analysis" for use in the Documented Safety Analysis (DSA).

Memorandum PU06-124 listed the B332 safety basis calculations, and identified those calculations that do not strictly follow AB-006, but have been verified to have had a technical review. Memorandum PU06-124 also listed those safety basis calculations for which the independent review could not be located, and accepted those calculations on an interim basis pending completion of an appropriate SME review.

This memorandum verifies completion of the appropriate SME review for those B332 DSA safety basis calculations which were accepted in memorandum PU06-124 on an interim basis. Attachment 1 identifies the calculations which received an appropriate subject matter expert review.

Roger R. Rocha
Plutonium Facility Manager

ATTACHMENT H

Attachments: 1. B332 safety basis calculations with appropriate SME review

cc w/attachments:

Altenbach, Tom	L-375
Chin, Desmond	L-372
Foote, Ken	L-372
Palmrose, Don	L-375
Pinkston, Dave	L-375
Ragaini, Richard	L-372
Voss, Keith	L-372

Lawrence Livermore National Laboratory

Attachment 1: B332 safety basis calculations with appropriate SME review

Calculation Number or DSA Reference	Approval Date	Title	Strictly follows AB-006 (Y/N/NA)	Reviewer Approved (Y/N)	AB-006 requirement(s) not met.	SME Review
Chapter 2 Ref 26	10/1/1982	*Assessment of tornado and straight wind hazard probabilities at LBL, SLA, LLNL and SNLL* – McDonald, Mehta and Minor Consulting Engineers	N/A	Y	Prepared before implementation of AB-006.	PCAS-332-2006-027, November 7, 2006
Chapter 2 Ref 27	1/1/1980	*Tornado and high wind hazards at LLNL* – T. Theodore Fujita	N/A	Y	Prepared before implementation of AB-006.	PCAS-332-2006-027, November 7, 2006
Chapter 3 Ref 45	7/20/2000	Calculation of fuel-grade mixture – 30-year decay	N/A	Y	Prepared before implementation of AB-006.	HC-T1-06-172, October 9, 2006
CSM-432	1/21/1992	Maximum credible yields of potential nuclear excursions in B332	N/A	Y	Prepared before implementation of AB-006.	CSAM 06-172, November 7, 2006
CSM-670	5/27/1994	Maximum credible yields of excursions involving uranium systems in B332	N/A	Y	Prepared before implementation of AB-006.	CSAM 06-172, November 7, 2006
Chapter 3 Ref 96	9/26/1984	*Blast effects calculations, room 1010, B332* – Engineering Calculations, C. Y. King	N/A	Y	Prepared before implementation of AB-006.	PCAS-332-2006-025, November 7, 2006
Chapter 3 Ref 97	11/16/1988	*Explosion analysis, B332 room 1010 (MPL) & room 1009 (EDS)* – Engineering Calculations, C. Y. King	N/A	Y	Prepared before implementation of AB-006.	PCAS-332-2006-025, November 7, 2006

Calculation Number or DSA Reference	Approval Date	Title	Strictly follows AB-006 (Y/N/NA)	Reviewer Approved (Y/N)	AB-006 requirement(s) not met.	SME Review
Chapter 3 Ref 99	9/191996	*Glovebox duct internal pressure capability* – Memo to H. Woo, PES 96-141, Y. Chang	N/A	Y	Prepared before implementation of AB-006.	PCAS-332-2006-025, November 7, 2006
Chapter 3 Ref 113	12/1/1994	Aircraft accident probability study for the LLNL B332	N/A	N/A	Prepared before implementation of AB-006.	Not an AB-006 calculation. B332 DSA data was extracted from a table in Reference 113.
Chapter 3 Ref 123	12/7/1993	*Evaluation of B331 stack for seismic and wind load* – Memo to J. A. Carlsen, Y. Chang	N/A	Y	Prepared before implementation of AB-006.	PCAS-332-2006-026, November 7, 2006
Chapter 3 Ref 124	7/20/1978	*Structural calculations for additional support of 30 meter stacks (B331 complex)* – Holmes & Narver, Inc. J/R 331-528	N/A	Y	Prepared before implementation of AB-006.	PCAS-332-2006-026, November 7, 2006
MESN03-075-OA	7/21/2004	Gaseous hydrogen piping system for GB No. 7 and the metal conversion glovebox	N/A	N/A	Not prepared in AB-006 format	Equipment not yet installed. Will follow appropriate process for startup. This calculation will be properly completed and reviewed prior to system startup.

Interdepartmental letterhead

Mail Station: L-360

Ext: 3-9875

HAZARDS CONTROL DEPARTMENT
ES&H Teams Division
ES&H Team 1

October 9, 2006
HC-T1-06-172

TO: Roger Rocha L-360

FROM: Greg Jones

SUBJECT: Verification of Decay Corrections for Fuel Grade Pu Mixture

---

This memo serves to document an independent review of decay calculations for Fuel Grade (FG) Plutonium that were previously documented in a memo[1] dated July 20, 2000.

Given:
A Fuel Grade mix of the following:

Radionuclide	Mass Percent before decay
Pu-238	0.1
Pu-239	78.0
Pu-240	18.0
Pu-241	1.6
Pu-242	0.49
Am-241	1.9

A 30 year decay calculation was performed using the latest version of HOTSPOT- Health Physics Codes for the PC[2]. The FIDLER calibration module was selected and the FG mixture was entered using the values in the table above. Included below is the printed output of this calculation run. The results agree with the earlier established values.

This verification was performed at the request of K. Voss of the Authorization Basis Section in accordance with the guidelines established in AB-006.[3] Please contact me at 3-9875 or jones88@llnl.gov if you have any questions.

---

[1] LLNL memo W.Gary Mansfield to Ken Foote "Calculation of Fuel Grade Pu Mixture– 30 year Decay" 7/20/2000.
[2] *HOTSPOT Health Physics Codes for the PC* Hotspot Version 2.06 http://www.llnl.gov/nai/technologies/hotspot/
[3] Safety Basis Calculation Procedure for Category 2 and 3 Nuclear Facilities (AB-006)

ATTACHMENT I

FIDLER Calibration

File About

Calibration | Mixture | Lung Screen | Calibration Setup | Equipment I.D.

Plutonium Mixture

Isotope	Halflife (years)	Initial Mixture Age = 0 years (weight %)	Current Mixture Age = 30.00 years (weight %)
PU-238	87.74	0.1000	0.0789
PU-239	24065	78.0000	77.9326
PU-240	6537	18.0000	17.9428
PU-241	14.35	1.6000	0.3757
PU-242	376300	0.4900	0.4900
AM-241	432.2	1.9000	2.9994
		100.0900	

Mixture Age (years): 30.00

Current Mixture Specific Activity

ALPHA Curie: 0.2057 curie / gram

TOTAL Curie: 0.5926 curie / gram

Original Defaults

1 alpha microcurie of Mix = 0.4999 microcurie of Am-241

- or -

1 microcurie of Am-241 = 2.0005 alpha microcurie of Mix

100% Am-241

Print

Greg Jones
Health Physicist, ES&H Team 1
ES&H Teams Division
Hazards Control Department

GJ:bjc:HC-T1-06-172
Attachment: Fidler Calibration

Copy to:

Mansfield, G.	L-383
Mecozzi, J.	L-373
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RIR 98-47 (CONDITIONS 2 & 3)

Date: 4/9/98

CRITICALITY SAFETY
***Record of Independent Review**

1. This review form pertains to the following evaluation:

   Subject: OSP 332.84 Condition 2 & 3

   Name of Evaluator: Roger Gathers

2. Peer review of criticality safety evaluations are required in some cases. In general terms the test depends upon the answers to two questions: 1) Does this operation involve masses and configurations of fissionable materials that are outside of standard, handbook-like experience? 2) Have we done studies in the past that subsume the proposed masses and configurations? A Yes answer to 1) and No answer to 2) implies that peer review is required. The decision of whether or not to conduct a peer review is made by the Evaluator and the Criticality Safety Group Leader (CSGL) or his/her designated alternate. If either the Evaluator or the CSGL answer yes to the following question, then a panel of one or more must review this criticality safety evaluation. The CSGL will designate who will serve on the panel review, or he/she may perform it himself/herself.

   Should a panel review be conducted? (Circle answer and initial or sign.)

   Yes (No) Evaluator: Roger Gathers

   Yes (No) CS Group Leader: [signature] 4/17/98

   Comments: My comments were incorporated
   See attached documents. [signature]

If a panel review is conducted, the panel members must complete the rest of this form.

* A copy of this review record shall be kept with the original evaluation, and a second copy shall be entered in the panel review binder (located in the central office).

ATTACHMENT J

3. **[Complete this section for all panel reviews.]** The review panel considered the following items during a review of the above evaluation. (Place a check mark in the column that most nearly describes the consensus of the panel members.)

	Satisfactory	Requires Work	Not Applicable
Description of the process/device involved			
Description of the evaluation			
Fidelity of the calculational model used for the evaluation			
Degree of relevance of the handbook data used for the evaluation			
Conclusions drawn by evaluator			
Degree to which the proposed changes in the procedure, if any, address concerns voiced in the conclusions			
Other (specify)			

We, the undersigned, participated in this review and concur with the evaluation and conclusions:

Name	Signature	Date
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

4. **[Complete this section for all panel reviews.]**
Was further review of computer calculations deemed necessary by the panel?
(Circle one)

Yes No N/A

If deemed necessary, the assigned reviewer determined that the calculations are:
(Circle one)

Correct

Need to be corrected

Comments:

Reviewer:_____ Date:_____

5. **[Optional]** Comment(s): (Person writing the comment[s] must sign and date.)

L-128

2-7215

Hazards Control Department
Criticality Safety Group (Division Level)

April 8, 1998
CSM 954 Rev. 1

TO: Song Huang

FROM: Roger Gathers
Criticality Safety

SUBJECT: Crit Safety Analysis for OSP 332.84 Conditions 2 and 3

1. Introduction

This memo describes a continuation of the work described in CSM 952 [1]. The description of the vaults can be found there.

2. Condition 2

2.1 Definition

2.1.1 Form

1. Metal and/or approved dry compound

2.1.2 Fissile Mass

1. 4500 g Pu maximum limit (includes dispersible component)
2. 10000 g ^{235}U maximum limit (includes dispersible component)

2.1.3 Moderator & Reflector

1. No significant amounts allowed
2. The containers must be tightly sealed.
3. No liquids are allowed to be in storage with fissile material.

2.1.4 Geometry

1. All vault storage has controlled spacing

2. All fissile material must be stored in approved containers with 1.1 liter maximum volume.

2.1.5 Interaction

Condition 2 allows the presence of compounds and various moderators. Criticality safety calculations have been made for a considerable number of compounds and masses [2]. They include Pu_2C_3, Pu_2O_3, PuC, $PuCl_3$, $Pu(C_2O_4)_2$ PuF_3, PuF_4, PuH_2, PuH_3, $Pu(NO_3)_4$, PuO_2, and PuN for α^{239}Pu. UH_3, UN, UO_2, UO_3, U_3O_8, UCl_4, UF_4, $UO_2SO4\text{-}3H_2O$, $UO_2(NO_3)_2\text{-}6H_2O$, $UO_2(OH)_2$, and $UO_2C_2O_4\text{-}3H_2O$ for ^{235}U. The most reactive compounds seen were UH_3 and PuH_3, so these were selected for a study using a simplified model. The detailed study is described in reference [3]. The problems were run using MORSEC with the 92 group set (N92GRP) of multigroup cross sections derived from the ENDL library. using the HP workstation csag01.

3.2 Room 1338

Room 1338 has already seen considerable study [4]. Condition 2 allows 4.5 kg α^{239}Pu in a storage position. Problem prob6x60 [6] considers 4.5 kg α^{239}Pu spheres in all the open racks, tie-down positions, etc. The vault was flooded but no racks were double-batched in this scenario. The result was $k_{eff} = 0.9329 \pm 0.0049$. Problem prob6x140 [4] considers 4.5 kg α^{239}Pu spheres in all the open racks, tie-down positions, etc. All open racks were double-batched. The room was not flooded. The result was $k_{eff} = 0.9180 \pm 0.0049$. Water flooding and double-batching at the same time was not considered credible and hence was not considered in that evaluation, and is not considered here.

Condition 2 also allows 10 kg ^{235}U in a storage compartment. Problem prob6x62 [4] considers 18.5 kg ^{235}U spheres in the open racks, tie-down positions, etc. (This was the limit to be examined in that study.) The vault was flooded but no racks were double-batched in this scenario. The result was $k_{eff} = 0.9532 \pm 0.0049$. Problem prob6x142 [4] considers 18.5 kg ^{235}U spheres in the open racks, tie-down positions, etc. All open racks were double-batched (i.e., they contained two 18.5 kg spheres) but no flooding was present. The result was $k_{eff} = 0.9634 \pm 0.0049$. Water flooding and double-batching at the same time was not considered credible for ^{235}U either. Since these problem s have either the stated mass limit or considerably greater than the limits of condition 2, Room 1338 should be safe for condition 2 with the stated limit on the amount of metal provided both double-batching and flooding do not occur at the same time.

Condition 2 also allows the form to be compounds as well as metal. The compounds considered are PuH_3, UH_3, PuO_2, and UO_2. Since these were not considered in [4] additional studies were made using a simplified model that would apply to room 1050 and be conservative for rooms 1338 and 1051.

Four spheres of fissile material were located at the corners of a square and with a surface to surface separation of 8 in. The spheres were placed in contact with a one foot thick concrete wall. The proximity of the wall and the 8 in. separation corresponds to the situation in the lockers of Room 1050. Each sphere is in a separate locker and placed as close to the spheres in adjacent lockers as possible. To simulate double batching, an additional sphere was placed in contact with one of the four spheres and one diameter from the wall. One compartment is thus double-batched. Water flooding was then allowed to surround the spheres. Reflection boundary conditions were used to simulate an infinite plane of such cells. For computational convenience, the coordinate system used in the problems was symmetric. The reflection boundary conditions makes spheres in adjacent cells somewhat closer than they really are in the real situation. This only makes the model more conservative. For unflooded conditions the reactivity is low enough that the approximation is unimportant. For flooded conditions the water provides so much isolation that the approximation has negligible effect. The trihydrides are especially reactive and will have to be assigned a special mass limit for condition 2. A single 10 kg sphere of $^{235}UH_3$ next to a wall and flooded is critical with the reflection boundary conditions described above. For a single sphere next to the concrete wall and flooded the result is $k_{eff} = 0.9766 \pm 0.0048$. Table 1 describes the results for problems with Pu, U, PuH_3, UH_3, PuO_2, and UO_2 using the simplified model with both double-batching and full flooding. Table 2 describes results for double-batching only. Table 3 shows the results of reducing the mass of the trihydrides.

Table 1 Results for four 4.5 kg $\alpha^{239}Pu$, 4.5 kg $\alpha^{239}PuO_2$, 4.5 kg PuH_3, 10 kg ^{235}U, 10 kg $^{235}UO_2$, or 10 kg $^{235}UH_3$ spheres adjacent to a one foot thick concrete wall, spaced 8 in. apart and flooded. An additional sphere is located in contact with one of the spheres and one diameter from the wall to simulate a double-batch. The 8 in. constraint corresponds to blue vault locker geometry. Reflection boundary conditions were used as described above.

Problem	Material	k_{eff}
4sp57.10	Pu	1.0668 ± 0.0050
4sp58.10	U	0.9258 ± 0.0050
4sp47.10	PuH_3	0.9744 ± 0.0048
4sp49.10	UH_3	1.0715 ± 0.0049
4sp56.10	PuO_2	0.8368 ± 0.0049
4sp55.10	UO_2	0.7885 ± 0.0048

It can be seen from table 1 that the arrangement for 4.5 kg $\alpha^{239}Pu$ or 10 kg UH_3 is not simultaneously double-batch safe and flood safe. Table 2 shows that the materials are double-batch safe if there is no flooding.

Table 2 Results for four 4.5 kg $\alpha^{239}Pu$, 4.5 kg PuH_3, 10 kg ^{235}U, or 10 kg $^{235}UH_3$ spheres adjacent to a one foot thick concrete wall, spaced 8 in. apart. An additional sphere is located in contact with one of the spheres and one diameter from the wall. The 8 in. constraint corresponds to blue vault locker geometry. Reflection boundary conditions were used as described above.

Problem	Material	k_{eff}
4sph59.0	U	0.7142 ± 0.0048
4sph60.0	Pu	0.8548 ± 0.0048
4sph47.0	PuH_3	0.7558 ± 0.0048
4sph49.0	UH_3	0.8732 ± 0.0048

Table 3 Results of experiments in mass reduction. Four spheres of fissile material are located adjacent to a one foot thick concrete wall and spaced 8 in. apart. An additional sphere is located in contact with one of the spheres and one diameter from the wall to simulate a double-batch situation. The spheres are fully reflected by water except problem 4sp63.10 which has 1 in. of water around each sphere. The 8 in. constraint corresponds to blue vault locker geometry. Reflection boundary conditions were used as described above.

Problem	Material	Mass	k_{eff}
4sp61.10	UH_3	9 kg	1.0458 ± 0.0048
4sp62.10	UH_3	6 kg	0.9600 ± 0.0049
4sp63.10 *	UH_3	9 kg	0.9248 ± 0.0047
4sp64.10	PuH_3	3.5 kg	0.9118 ± 0.0049

* This problem has the spheres surrounded by 1 in of water.

3.3 Room 1050

Studies using the finite room model for Room 1050 were made for the $\alpha^{239}Pu$ and ^{235}U metals. Problem bvd12.10 listed in table 17 of CSM 950 [5] considers a scenario with 4.5 kg $\alpha^{239}Pu$ spheres on the bottom level and 2.6 kg $\alpha^{239}Pu$ spheres elsewhere. The bottom central position of a long wall has two 4.5 kg $\alpha^{239}Pu$ spheres side by side and against the concrete wall. The room is fully flooded. This is a local double-batch scenario. The result is $k_{eff} = 0.9357 \pm 0.0049$.

Problem bv4.10 listed in table 5 of CSM 950 [5] considers 15 kg ^{235}U with full flooding of the room. This is not a double-batch scenario. The results is keff = 0.9117 ± 0.0048.

The simplified model studies described above are designed specifically to cover the situation in Room 1050. The results for PuH_3, UH_3, PuO_2, and UO_2 are thus directly applicable.

A comparison between the simplified model and the finite room model for Room 1050 was made for 4.5 kg $\alpha^{239}Pu$ spheres. Simplified model problem 4sph53.0 for four 4.5 kg $\alpha^{239}Pu$ spheres next to the wall and with one sphere double-batched but dry can be compared to finite room model problem bvdb6.0. The simplified model gives $k_{eff} = 0.8728 \pm 0.0049$ and the finite room model gives $k_{eff} = 0.8443 \pm 0.0049$.

Simplified model problem 4sp54.10 considers 4.5 kg $\alpha^{239}Pu$ spheres next to the wall and fully flooded, but not double-batched. The result is $k_{eff} = 0.9491 \pm 0.0049$. This can be compared to finite room model problem bv1.10 which gives $k_{eff} = 0.9414 \pm 0.0049$. The simplified model thus gives a more conservative result than the finite room model.

3.4 Room 1051

For Room 1051 a finite room model was made which could be combined with the model for Room 1050. The model retained the dimensions of the room but used all whirlpool freezers spaced at the minimum separation encountered in the room. The freezers were assumed to contain one foot separators located in the center of the box to divide it into two compartments. Studies were made for both 4.5 kg $\alpha^{239}Pu$ and 10 kg ^{235}U with the lower compartment (nearest the floor) double-batched. The infinite line problem fv5.10 in CSM 951 [6] considered 4.5 kg $\alpha^{239}Pu$ double-batched and flooded and gave a result $k_{eff} = 1.0349 \pm 0.0049$. The infinite line problem fv6.10 considered 10 kg ^{235}U double-batched and flooded and gave a result $k_{eff} = 0.9130 \pm 0.0048$. It can be seen from these results that Room1051 is not double-batch and flood safe at the same time. Since the flooding of the vaults to a level that would cover the first compartment is not considered credible, this case is OK.

The simplified model results for PuH_3, UH_3, PuO_2, and UO_2 described above are applicable to Room 1051.

Note that the 5 gallon outer container required for condition 2 is enough to prevent double-batching since the package is large enough that no more than one can fit in a single storage location.

4. Controls

4.1 Form

1. Metal and/or approved dry compound. PuH_3 and UH_3 are not allowed.

4.2 Fissile Mass

1. 4500 g Pu maximum limit (includes dispersible component)
2. 10000 g ^{235}U maximum limit (includes dispersible component)

4.3 Moderator & Reflector

1. No significant amounts allowed
2. The containers must be tightly sealed.
3. No liquids are allowed to be in storage with fissile material.

4.4 Geometry

1. All vault storage has controlled spacing
2. All fissile material must be stored in approved containers with 1.1 liter maximum volume.
3. The 1.1 max. liter containers must be stored ~~in a~~ sealed container with minimum volume of 5 gallons. Only one inner container is allowed in a 5 gallon container. If a single piece can't be placed in a 1.1 liter container, it should be treated under condition 3.

There is no restriction on 5 gal container ✓

4.5 Interaction

1. Only one 5 gallon container will fit in any of the storage compartments.

References

1. CSM 952, " Crit Safety Analysis for OSP 332.84 Condition 1", April 3, 1998

2. CSM 893, "Criticality Safety Evaluation for Fissionable Material Revision in Workstations #7801, #7802 and #7806 in Room 1378, Building 332.", T. Chiao, July 11, 1997

3. CSM 949 "Moderator Control in B332 Vaults", April 3, 1998

4. CSM 678, Criticality Safety Analysis for OSP 332.84 (Vaults). Nov. 22, 1994

5. CSM 950 "Crit Safety Analysis for B332, Room 1050", April 3, 1998

6. CSM 951 "Crit Safety Analysis for B332, Room 1051", April 3, 1998

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2-7215

Hazards Control Department
Criticality Safety Group (Division Level)

April 8, 1998
CSM 954

TO: Song Huang

FROM: Roger Gathers
Criticality Safety

SUBJECT: Crit Safety Analysis for OSP 332.84 Conditions 2 and 3

1. Introduction

This memo describes a continuation of the work described in CSM 952 [1]. The description of the vaults can be found there.

2. Condition 2

2.1 Definition

2.1.1 Form

1. Metal and/or approved dry compound

2.1.2 Fissile Mass

1. 4500 g Pu maximum limit (includes dispersible component)
2. 10000 g ^{235}U maximum limit (includes dispersible component)

2.1.3 Moderator & Reflector

1. No significant amounts allowed
2. The containers must be tightly sealed.
3. No liquids are allowed to be in storage with fissile material.

2.1.4 Geometry

1. All vault storage has controlled spacing

2. All fissile material must be stored in approved containers with 1.1 liter maximum volume.

3. The 1.1 max. liter containers must be stored in a sealed container with minimum volume of 5 gallons. Only one inner container is allowed in a 5 gallon container.

2.1.5 Interaction

1. Only one 5 gallon container will fit in any of the storage compartments.

Condition 2 allows the presence of compounds and various moderators. Criticality safety calculations have been made for a considerable number of compounds and masses [2]. They include Pu_2C_3, Pu_2O_3, PuC, $PuCl_3$, $Pu(C_2O_4)_2$ PuF_3, PuF_4, PuH_2, PuH_3, $Pu(NO_3)_4$, PuO_2, and PuN for $\alpha^{239}Pu$. UH_3, UN, UO_2, UO_3, U_3O_8, UCl_4, UF_4, $UO_2SO4\text{-}3H_2O$, $UO_2(NO_3)_2\text{-}6H_2O$, $UO_2(OH)_2$, and $UO_2C_2O_4\text{-}3H_2O$ for ^{235}U. The most reactive compounds seen were UH_3 and PuH_3, so these were selected for a study using a simplified model. The detailed study is described in reference [3]. The problems were run using MORSEC with the 92 group set (N92GRP) of multigroup cross sections derived from the ENDL library. using the HP workstation csag01.

3.2 Room 1338

Room 1338 has already seen considerable study [4]. Condition 2 allows 4.5 kg $\alpha^{239}Pu$ in a storage position. Problem prob6x60 [6] considers 4.5 kg $\alpha^{239}Pu$ spheres in all the open racks, tie-down positions, etc. The vault was flooded but no racks were double-batched in this scenario. The result was $k_{eff} = 0.9329 \pm 0.0049$. Problem prob6x140 [4] considers 4.5 kg $\alpha^{239}Pu$ spheres in all the open racks, tie-down positions, etc. All open racks were double-batched. The room was not flooded. The result was $k_{eff} = 0.9180 \pm 0.0049$. Water flooding and double-batching at the same time was not considered credible and hence not considered in this evaluation

Condition 2 also allows 10 kg ^{235}U in a storage compartment. Problem prob6x62 [4] considers 18.5 kg ^{235}U spheres in the open racks, tie-down positions, etc. The vault was flooded but no racks were double-batched in this scenario. The result was $k_{eff} = 0.9532 \pm 0.0049$. Problem prob6x142 [4] considers 18.5 kg ^{235}U spheres in the open racks, tie-down positions, etc. All open racks were double-batched but no flooding was present. The result was $k_{eff} = 0.9634 \pm 0.0049$. Water flooding and double-batching at the same time was not considered for ^{235}U either. Since these problem s have either the stated mass limit or considerably greater than the limits of condition 2, Room 1338 should be safe for condition 2 with the stated limit on the amount of metal provided both double-batching and flooding do not occur at the same time.

Condition 2 also allows the form to be compounds as well as metal. The compounds considered are PuH_3, UH_3, PuO_2, and UO_2. Since these were not considered in [4]

additional studies were made using a simplified model that would apply to room 1050 and be conservative for rooms 1338 and 1051.

Four spheres of fissile material were located at the corners of a square and with a surface to surface separation of 8 in. The spheres were placed in contact with a one foot thick concrete wall. The proximity of the wall and the 8 in. separation corresponds to the situation in the lockers of Room 1050. Each sphere is in a separate locker and placed as close to the spheres in adjacent lockers as possible. To simulate double batching, an additional sphere was placed in contact with one of the four spheres and one diameter from the wall. One compartment is thus double-batched. Water flooding was then allowed to surround the spheres. Reflection boundary conditions were used to simulate an infinite plane of such cells. For computational convenience, the coordinate system used in the problems was symmetric. The reflection boundary conditions makes spheres in adjacent cells somewhat closer than they really are in the real situation. This only makes the model more conservative. For unflooded conditions the reactivity is low enough that the approximation is unimportant. For flooded conditions the water provides so much isolation that the approximation has negligible effect. The trihydrides are especially reactive and will have to be assigned a special mass limit for condition 2. A single 10 kg sphere of $^{235}UH_3$ next to a wall and flooded is critical with the reflection boundary conditions described above. For a single sphere next to the concrete wall and flooded the result is $k_{eff} = 0.9766 \pm 0.0048$. Table 1 describes the results for problems with Pu, U, PuH_3, UH_3, PuO_2, and UO_2 using the simplified model with both double-batching and full flooding. Table 2 describes results for double-batching only. Table 3 shows the results of reducing the mass of the trihydrides.

Table 1 Results for four 4.5 kg $\alpha^{239}Pu$, 4.5 kg $\alpha^{239}PuO_2$, 4.5 kg PuH_3, 10 kg ^{235}U, 10 kg $^{235}UO_2$, or 10 kg $^{235}UH_3$ spheres adjacent to a one foot thick concrete wall, spaced 8 in. apart and flooded. An additional sphere is located in contact with one of the spheres and one diameter from the wall to simulate a double-batch. The 8 in. constraint corresponds to blue vault locker geometry. Reflection boundary conditions were used as described above.

Problem	Material	k_{eff}
4sp57.10	Pu	1.0668 ± 0.0050
4sp58.10	U	0.9258 ± 0.0050
4sp47.10	PuH_3	0.9744 ± 0.0048
4sp49.10	UH_3	1.0715 ± 0.0049
4sp56.10	PuO_2	0.8368 ± 0.0049
4sp55.10	UO_2	0.7885 ± 0.0048

Do you know why this is more reactive than PuH_3 ? not w/o more examination -

It can be seen from table 1 that the arrangement for 4 kg $\alpha^{239}Pu$ or 10 kg UH_3 is not simultaneously double-batch safe and flood safe. Table 2 shows that the materials are double-batch safe if there is no flooding.

Table 2 Results for four 4.5 kg $\alpha^{239}Pu$, 4.5 kg PuH_3, 10 kg ^{235}U, or 10 kg $^{235}UH_3$ spheres adjacent to a one foot thick concrete wall, spaced 8 in. apart. An additional sphere is located in contact with one of the spheres and one diameter from the wall. The 8 in. constraint corresponds to blue vault locker geometry. Reflection boundary conditions were used as described above.

Problem	Material	k_{eff}
4sph59.0	U	0.7142 ± 0.0048
4sph60.0	Pu	0.8548 ± 0.0048
4sph47.0	PuH_3	0.7558 ± 0.0048
4sph49.0	UH_3	0.8732 ± 0.0048

Table 3 Results of experiments in mass reduction. Four spheres of fissile material are located adjacent to a one foot thick concrete wall and spaced 8 in. apart. An additional sphere is located in contact with one of the spheres and one diameter from the wall to simulate a double-batch situation. The spheres are fully reflected by water except problem 4sp63.10 which has 1 in. of water around each sphere. The 8 in. constraint corresponds to blue vault locker geometry. Reflection boundary conditions were used as described above.

Problem	Material	Mass	k_{eff}
4sp61.10	UH_3	9 kg	1.0458 ± 0.0048
4sp62.10	UH_3	6 kg	0.9600 ± 0.0049
4sp63.10 *	UH_3	9 kg	0.9248 ± 0.0047
4sp64.10	PuH_3	3.5 kg	0.9118 ± 0.0049

* This problem has the spheres surrounded by 1 in of water.

3.3 Room 1050

Studies using the finite room model for Room 1050 were made for the α^{239}Pu and ^{235}U metals. Problem bvd12.10 listed in table 17 of CSM 950 [5] considers a scenario with 4.5 kg α^{239}Pu spheres on the bottom level and 2.6 kg α^{239}Pu spheres elsewhere. The bottom central position of a long wall has two 4.5 kg α^{239}Pu spheres side by side and against the concrete wall. The room is fully flooded. The result is $k_{eff} = 0.9357 \pm 0.0049$.

Problem bv4.10 listed in table 5 of CSM 950 [5] considers 15 kg ^{235}U with full flooding of the room. The results is keff = 0.9117 ± 0.0048.

The simplified model studies described above are designed specifically to cover the situation in Room 1050. The results for PuH_3, UH_3, PuO_2, and UO_2 are thus directly applicable.

A comparison between the simplified model and the finite room model for Room 1050 was made for 4.5 kg α^{239}Pu spheres. Simplified model problem 4sph53.0 for four 4.5 kg α^{239}Pu spheres next to the wall and with one sphere double-batched but dry can be compared to finite room model problem bvdb6.0. The simplified model gives $k_{eff} = 0.8728 \pm 0.0049$ and the finite room model gives $k_{eff} = 0.8443 \pm 0.0049$.

Simplified model problem 4sp54.10 considers 4.5 kg α^{239}Pu spheres next to the wall and fully flooded, but not double-batched. The result is $k_{eff} = 0.9491 \pm 0.0049$. This can be compared to finite room model problem bv1.10 which gives $k_{eff} = 0.9414 \pm 0.0049$. The simplified model thus gives a more conservative result than the finite room model.

3.4 Room 1051

For Room 1051 a finite room model was made which could be combined with the model for Room 1050. The model retained the dimensions of the room but used all whirlpool freezers spaced at the minimum separation encountered in the room. The freezers were assumed to contain one foot separators located in the center of the box to divide it into two compartments. Studies were made for both 4.5 kg α^{239}Pu and 10 kg ^{235}U with the lower compartment (nearest the floor) double-batched. The infinite line problem fv5.10 in CSM 951 [6] considered 4.5 kg α^{239}Pu double-batched and flooded and gave a result $k_{eff} = 1.0349 \pm 0.0049$. The infinite line problem fv6.10 considered 10 kg ^{235}U double-batched and flooded and gave a result $k_{eff} = 0.9130 \pm 0.0048$. It can be seen from these results that Room1051 is not double-batch and flood safe at the same time. The simplified model results for PuH_3, UH_3, PuO_2, and UO_2 described above are applicable to Room 1051.

Note that the 5 gallon outer container required for condition 2 is enough to prevent double-batching since the package is large enough that no more than one can fit in a single storage location.

4. Controls

4.1 Form

1. Metal and/or approved dry compound. PuH_3 and UH_3 are not allowed.

4.2 Fissile Mass

1. 4500 g Pu maximum limit (includes dispersible component)
2. 10000 g ^{235}U maximum limit (includes dispersible component)

4.3 Moderator & Reflector

1. No significant amounts allowed
2. The containers must be tightly sealed.
3. No liquids are allowed to be in storage with fissile material.

4.4 Geometry

1. All vault storage has controlled spacing
2. All fissile material must be stored in approved containers with 1.1 liter maximum volume.
3. The 1.1 max. liter containers must be stored in a sealed container with minimum volume of 5 gallons. Only one inner container is allowed in a 5 gallon container. If a single piece can't be placed in a 1.1 liter container, it should be treated under condition 3.

4.5 Interaction

1. Only one 5 gallon container will fit in any of the storage compartments.

5. Condition 3

5.1 Form

1. Approved unit or assembly.

5.2 Fissile Mass

As stated on Memo authorizing specified unit on Approved List.

5.3 Moderator & Reflector

As stated on Memo authorizing specified unit on Approved List.

5.4 Geometry

1. All vault storage has controlled spacing.

2. Must be stored in container specified in authorizing Memo.

5.5 Interaction

Must be stored in approved location.

Condition 3 is an open category that must be analyzed as needed once the character of the item is specified. There is thus no need at this point to discuss it on a room by room basis.

References

1. CSM 952, " Crit Safety Analysis for OSP 332.84 Condition 1", April 3, 1998

2. CSM 893, "Criticality Safety Evaluation for Fissionable Material Revision in Workstations #7801, #7802 and #7806 in Room 1378, Building 332.", T. Chiao, July 11, 1997

3. CSM 949 "Moderator Control in B332 Vaults", April 3, 1998

4. CSM 678, Criticality Safety Analysis for OSP 332.84 (Vaults). Nov. 22, 1994

5. CSM 950 "Crit Safety Analysis for B332, Room 1050", April 3, 1998

6. CSM 951 "Crit Safety Analysis for B332, Room 1051", April 3, 1998

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T. Chiao	L-128
J. Scorby	L-128
J. Pearson	L-379
R. Evarts	L-128
R. Gathers	L-128
P. Chou	L-128
J. Burch	L-128
File	L-128

Interdepartmental letterhead
Mail Station L- 198
Ext: 3-4131

HAZARDS CONTROL DEPARTMENT
Criticality Safety Section

November 7, 2006
CSAM 06-172

TO: Richard Ragaini L-626

FROM: John Scorby

SUBJECT: **Criticality Safety Section Independent Review of CSM432 and CSM670**

In response to your request for confirmation of independent reviews of criticality safety memoranda (CSAMs and CSMs) which support the B332 DSA, several Record of Independent Review (RIRs) forms have already been provided. Two older evaluations, CSM 432 and CSM 670 do not have RIRs. This memorandum documents the reviews performed by the Criticality Safety Section (CSS) of these two CSMs.

Chuck Barnett, the Criticality Safety Section Leader (CSSL) at the time these two CSMs were issued, indicated in CSAM 00-238, that the practice at that time was to not apply the RIR process to CSMs which were generated to provide input to safety analysis or environmental impact documents. Similarly, the revised input provided in 2000 for the B332 SAR update referencing these two CSMs was also provided without an RIR. The expectation is that such documents will be subsequently submitted for formal review by all the disciplines, at which time the CSS would perform and document the review in an RIR. This was the case for the B332 DSA which was reviewed by the CSS and documented in RIR03-211.

Regarding the technical content of CSM 432 and CSM 670 specifically, though no formal RIR was generated, both documents received considerable independent review within the CSS: Chuck Barnett reviewed the final draft prior to release; the CSMs along with several similar published studies were reviewed by myself in 2000 prior to providing revised input to the B332 SAR; Dave Heinrichs, the current CSSL, is familiar with the content of the two CSMs and recalls reviewing these documents with the author and Chuck Barnett; and finally the scope of the CSS independent review of the B332 DSA, documented in RIR03-211, specifically addressed Chapter 6 which is predicated on all relevant information in the DSA, including the discussion and conclusions of the two CSMs. Note that the CSMs are not calculations as defined by the procedure AB-006. Rather, they include a discussion and review of published literature regarding criticality accident history, theory, and experimental results.

If there are any questions or concerns, please contact me at extension 3-4131.

ATTACHMENT K

John Scorby
Criticality Safety Section

cc:

	CSAM File	L-198
	B332 File	L-198
	Dave Heinrichs	L-198
	John Pearson	L-198

Interdepartmental letterhead
Mail Station: L-786
Ext: 2-8802

ENVIRONMENTAL PROTECTION DEPARTMENT
RADIOACTIVE AND HAZARDOUS WASTE MANAGEMENT

September 25, 2006

TO: Stephanie Goodwin, L-626

FROM: Kerry Cadwell, Facility Manager of the Waste Storage Facilities

SUBJECT: **Acceptance of Safety Basis Calculations for RHWM Waste Storage Facilities**

This memorandum satisfies Action 2 of the NTS-OAK—LLNL-LLNL-2005-0010 Response Plan, which requires Facility Managers to document acceptance of safety basis calculations that do not strictly follow Authorization Basis procedure AB-006, "Safety Basis Calculation Procedure for Category 2 and 3 Nuclear Facilities for use in the Documented Safety Analysis." Attachment 1 lists the Waste Storage Facilities safety basis calculations and identifies those that do not strictly follow AB-006. I accept calculations 1-15 for use in the Waste Storage Facilities Documented Safety Analysis. Calculation 16 did not have a technical reviewer. An informal review of the calculation performed as part of this assessment determined that the results are valid. As required by the NTS-OAK—LLNL-LLNL-2005-0010 Response Plan, the review of calculation 16 will be formally documented per AB-006, and the Facility Manager acceptance of this calculation will be documented through the established AB-006 process.

Kerry Cadwell

Kerry Cadwell

Sept 25, 2006
Date

ATTACHMENT L

Attachment(s): 1. Waste Storage Facilities safety basis calculations
2. Explanation of codes

cc w/attachments:		
	Altenbach, Tom	L-375
	Bowers, John	L-786
	Epperson, Patrick	L-626
	Hainebach, Kem	L-547
	Larson, Heather	L-547
	Palmrose, Don	L-375
	Pinkston, Dave	L-375
	Sims, Jack	L-547

Attachment 1: Waste Storage Facilities safety basis calculations

No.	Calc. No.	Approval Date	Title	Strictly follows requirements of AB-006 (Y/N/NA)	Reviewer Approved (Y/N)	Comments (List code of requirement(s) not met - see Attachment 2 for code explanations)
1	None	10/25/91	Seismic Review Report for Chemical Waste Facility Building 693	NA	Y	Prepared before implementation of AB-006
2	None	11/27/91	Seismic Review Report for Chemical Waste Facility Building 612-2	NA	Y	Prepared before implementation of AB-006
3	None	10/25/91	Seismic Review Report for Hazardous Waste Facility Building 614	NA	Y	Prepared before implementation of AB-006
4	None	6/8/93	Seismic Review Report for Hazardous Waste Facility Building 612A	NA	Y	Prepared before implementation of AB-006
5	None	6/30/00	Bldg. 625 Seismic/Wind Evaluation for PC-2 Criteria	NA	Y	Prepared before implementation of AB-006
6	None	6/28/96	LLNL DTWF Solid Waste and Rad Waste Storage Building, and Chemical Exchange Warehouse – Phase 3A (Title 2): Design Criteria - Structural Calculation	NA	Y	Prepared before implementation of AB-006
7	WM/FS-WSF-0403	3/5/04	Aircraft Crash into Building Storing TRU Waste	N	Y	Prepared as AB-006 calculation. Lacked table of contents (C1) and section headings for C5 and C6, but contained appropriate technical content
8	HC/AB-B696-0302	5/19/03	Aircraft Crash Consequence Analysis	N	Y	Prepared as AB-006 calculation. Lacked table of contents (C1) and section headings for C5 and C6, but contained appropriate technical content
9	WM/FS-WSF-0404	3/3/04	Compartment Fire Dose Consequence Analysis	N	Y	Prepared as AB-006 calculation. Lacked table of contents (C1) and section headings for C5, C6, and C7, but contained appropriate technical content

No.	Calc. No.	Approval Date	Title	Strictly follows requirements of AB-006 (Y/N/NA)	Reviewer Approved (Y/N)	Comments (List code of requirement(s) not met - see Attachment 2 for code explanations)
10	WM/FS-WSF-0401	2/12/04	Dose Consequence from Tritium Release	N	Y	Prepared as AB-006 calculation. Lacked table of contents (C1) and section headings for C5 and C6, but contained appropriate technical content
11	HC/AB-B696-0301	3/6/03	Fire involving flammable liquids and separation distances	N	Y	Prepared as AB-006 calculation. Lacked table of contents (C1) and section headings for C5, C6, and C7, but contained appropriate technical content
12	WM/FS-WSF-0402	3/5/04	Non-Buoyant Dose Consequence Analysis	N	Y	Prepared as AB-006 calculation. Lacked table of contents (C1) and section headings for C5 and C6, but contained appropriate technical content
13	WM/WT-B696-0201	10/14/02	Structural Response in Airplane Crash	N	Y	Prepared as AB-006 calculation. Lacked table of contents (C1) and section headings for C5, C6, and C7, but contained appropriate technical content
14	HC/AB-B696-0203	10/25/02	WMD Dose Consequence Analysis	N	Y	Prepared as AB-006 calculation. Lacked table of contents (C1) and section headings for C5 and C6, but contained appropriate technical content
15	HC/AB-B696-0202	6/ 7/02	Radiolytic Hydrogen Deflagration	N	Y	Prepared as AB-006 calculation. Lacked table of contents (C1) and section headings for C5 and C6, but contained appropriate technical content
16	FS&C 02-023	3/21/02	Calculation of Lightning Strike on HWM Facilities	N	N	Not prepared in AB-006 format (P1, P2, P3, P4, P5, P6, C5, C6, C7, C8, R1, R2, R3, R4)

Attachment 2: Explanation of codes

Calculation Title				
Calculation Number	Date Calculation Approved			
Strictly meets AB-006 requirements:		Y	N	N/A
Preparer Actions				
P1	Sequential sheet number on each sheet			
P2	Total number of sheets on each sheet			
P3	Unique calculation number on each sheet			
P4	Revision identified on each sheet			
P5	Calculation Cover Sheet Attached and preparer sections filled in			
P6	Security Classification determined and document is appropriately marked			
Required Section Headings in Calculation Body				
C1	Table of contents (required if calculation contains attachments or appendices)			
C2	Revision Description (Optional)			
C3	Open Items (required for preliminary calculations)			
C4	References (required if references are key to the calculation)			
C5	Input (required for all calculations)			
C6	Analytical Methods and Computations (required for all calculations)			
C7	Results (required for all calculations)			
C8	Conclusion (required for all calculations)			
C9	Attachments and appendices (optional)			
Review and approval				
R1	Review method listed on Calculation Cover Sheet			
R2	Reviewer signed and dated calculation			
R3	Responsible Manager signed and dated calculation			
R4	Facility Manager signed and dated calculation			
Calculation by Others (subcontractors to LLNL)				
S1	Cover sheet prepared			
Comments				

Interdepartmental letterhead
Mail Station: L-786
Ext: 2-7756

ENVIRONMENTAL PROTECTION DEPARTMENT
RADIOACTIVE AND HAZARDOUS WASTE MANAGEMENT

September 25, 2006

TO: Stephanie Goodwin, L-626

FROM: John Bowers, Facility Manager of the B695 Segment of the DWTF

SUBJECT: **Acceptance of Safety Basis Calculations for B695 Segment of the DWTF**

This memorandum satisfies Action 2 of the NTS-OAK—LLNL-LLNL-2005-0010 Response Plan, which requires Facility Managers to document acceptance of safety basis calculations that do not strictly follow Authorization Basis procedure AB-006, "Safety Basis Calculation Procedure for Category 2 and 3 Nuclear Facilities for use in the Documented Safety Analysis." Attachment 1 lists the B695 Segment of the DWTF safety basis calculations and identifies those that do not strictly follow AB-006. I accept calculations 1 and 2 for use in the B695 Segment of the DWTF Documented Safety Analysis. Calculation 3 did not have a technical reviewer. An informal review of the calculation performed as part of this assessment determined that the results are valid. As required by the NTS-OAK—LLNL-LLNL-2005-0010 Response Plan, the review of calculation 3 will be formally documented per AB-006, and the Facility Manager acceptance of this calculation will be documented through the established AB-006 process.

J. J. Bowers
John Bowers

9/25/6
Date

ATTACHMENT M

Attachment(s): 1. B695 Segment of the DWTF safety basis calculations
2. Explanation of codes

cc w/attachments:		
	Altenbach, Tom	L-375
	Cadwell, Kerry	L-786
	Epperson, Patrick	L-626
	Hainebach, Kem	L-547
	Larson, Heather	L-547
	Palmrose, Don	L-375
	Pinkston, Dave	L-375
	Sims, Jack	L-547

Attachment 1: B695 Segment of the DWTF safety basis calculations

No.	Calc. No.	Approval Date	Title	Strictly follows requirements of AB-006 (Y/N/NA)	Reviewer approved (Y/N)	Comments (List code of requirement(s) not met – see Attachment 2 for code explanations)
1	None	10/23/96	DTWF Liquid Waste Process Building & Classified Waste Storage – Title 2 (Phase 3B): Design Criteria - Structural Calculation	NA	Y	Prepared before implementation of AB-006
2	WM/FS-B695-0401	2/10/05	Evaluation of 400 gallon Sulfuric Acid release at an Elevated Temperature	Y	Y	
3	FS&C 02-023	3/21/02	Calculation of Lightning Strike on HWM Facilities	N	N	Not prepared in AB-006 format (P1, P2, P3, P4, P5, P6, C5, C6, C7, C8, R1, R2, R3, R4)

Attachment 2: Explanation of codes

Calculation Title				
Calculation Number	Date Calculation Approved			
Strictly meets AB-006 requirements:		Y	N	N/A
Preparer Actions				
P1	Sequential sheet number on each sheet			
P2	Total number of sheets on each sheet			
P3	Unique calculation number on each sheet			
P4	Revision identified on each sheet			
P5	Calculation Cover Sheet Attached and preparer sections filled in			
P6	Security Classification determined and document is appropriately marked			
Required Section Headings in Calculation Body				
C1	Table of contents (required if calculation contains attachments or appendices)			
C2	Revision Description (Optional)			
C3	Open Items (required for preliminary calculations)			
C4	References (required if references are key to the calculation)			
C5	Input (required for all calculations)			
C6	Analytical Methods and Computations (required for all calculations)			
C7	Results (required for all calculations)			
C8	Conclusion (required for all calculations)			
C9	Attachments and appendices (optional)			
Review and approval				
R1	Review method listed on Calculation Cover Sheet			
R2	Reviewer signed and dated calculation			
R3	Responsible Manager signed and dated calculation			
R4	Facility Manager signed and dated calculation			
Calculation by Others (subcontractors to LLNL)				
S1	Cover sheet prepared			
Comments				

Interdepartmental letterhead
Mail Station L-510
Ext: 3-5132

PATS
Packaging And Transportation Safety

November 16, 2006
SEP-1260

To: William A. Bookless
Associate Director
Safety and Environmental Protection Directorate

From: Dennis P. Barrett

Subject: Acceptance of the Safety Basis Calculations for the Nuclear Materials Transportation Safety Manual (TSD)

Reference: Letter to Holman from Altenbach, NTS-OAK- LLNL-LLNL 2005-0010 Response Plan dated August 8, 2006

This memorandum satisfies Action 2 of the NTS-OAK—LLNL-LLNL-2005-0010 Response Plan, attachment 1, which requires the Nuclear Facility Managers or PATS Program Manager to document acceptance of safety basis calculations that do not strictly follow Authorization Basis procedure AB-006, *Safety Basis Calculation Procedure for Category 2 and 3 Nuclear Facilities for Use in the Document Safety Analysis.*

The list of safety basis calculations attachment 2, that are referred in the Nuclear Materials Transportation Safety Manual (TSD) are identified along with those that do not strictly follow the AB-006 procedure. The attachment 3 lists the review checklists of the safety basis calculations, which are referred in attachment 1. An informal review of the calculations performed as part of this assessment determined that the calculations and their results are valid and satisfied the requirements of the NTS-OAK—LLNL-LLNL-2005-0010 Response Plan.

Dennis P. Barrett
PATS Program Manager

University of California
Lawrence Livermore
National Laboratory

ATTACHMENT N

Attachments:
1. Letter to Holman from Altenbach, NTS-OAK- LLNL-LLNL 2005-0010 Response Plan dated August 8, 2006
2. Safety Basis Calculations List
3. Review Checklist of the Safety Basis Calculations

cc:

Altenbach, Tom	L-375
Beach, D. Rex	L-668
Larson, Heather	L-547
Natali, Ron	L-510
Nguyen, Son	L-375
Palmrose, Don	L-375

Attachment 1

Letter to Holman from Altenbach, NTS-OAK- LLNL-LLNL 2005-0010
Response Plan dated August 8, 2006

Interdepartmental letterhead **Hazards Control Department**

Mail Station L-375 Authorization Basis Section

Ext: 2-1285

August 8, 2006

To: Garry Holman, ES&H Assurance Office

From: Thomas Altenbach, Authorization Basis Deputy Section Leader

Subject: NTS-OAK—LLNL-LLNL2005-0010 Response Plan

The Subject NTS Report requires that the "SEP Directorate will develop a plan for performing a formal management review of the discovered condition, including an extent-of-condition evaluation" relating to the discovery that the "administrative requirements of AB Procedure AB-006 Safety Basis Calculation Procedure for Category 2 and 3 Nuclear Facilities have not been uniformly or consistently applied in the preparation of Safety Basis calculations for LLNL Hazard Category 2 and Category 3 nuclear facilities." This memo constitutes the Directorate's Plan.

Action 1

An AB-006 Working Group has been formed, led by the AB Section, with representatives from NMTP, RHWM, and PATS.

- Status: A kickoff meeting was held on 7/24/06.
- Periodic meetings will continue until the remaining actions are completed.

Action 2

Any potential gaps for calculations to date must be closed. Working Group members will lead a review of all safety basis calculations contained or referenced in their respective DSAs.
The review will:

- List which safety basis calculations correctly follow AB-006 and therefore require no additional documentation.
- Identify and list which safety basis calculations do not strictly follow AB-006. These include NMTP Engineering Notes, Engineering Safety Notes, calculations by organizations external to the nuclear facilities (such as Plant Engineering), subcontractor calculations, and other internally generated calculations. Each of these will be reviewed and listed on a memorandum with the facility manager's (or designee's) signature accepting that calculation for use in the DSA. If any of these calculations are lacking the signature of a technical reviewer, they must also be reviewed for technical content and that review documented per AB-006.
- Safety basis calculations contained in or referenced by USQ Determinations will not be included in this review, since the signatures of the USQ Preparer, Reviewer, and Approver are sufficient to meet the intent of AB-006.
- Estimated Completion Date: 9/22/06.

Attachment 2

List of the Safety Basis Calculations that are referred in the Nuclear Materials Transportation Safety Manual (TSD) and identified those that do not strictly follow the AB-006 procedure.

Attachment 2. List of the Safety Basis Calculations that are referred in the Nuclear Materials Transportation Safety Manual (TSD) and identified those that do not strictly follow the AB-006 procedure.

Document Number	Approval Date	Title	Strictly follows requirements of AB-006	Reviewer Approved	Requirements not met
			(Y/N)	(Y/N)	List code of requirement(s) not met
WSMS-LP-03-0002	10/3/03	Frequency Of Human Error Induced During Onsite Transfers Of A Materials Management (MM) Package at LLNL		Y	Classification Marking (Official Use Only) was on the coversheet but was not signed by a classification Officer.
WSMS-LP-03-0003 (Rev. 1)	10/3/03	Frequency Estimation of a Criticality at LLNL due to a RHWM Transfer Accident		Y	Classification Marking (Official Use Only) was on the coversheet but was not signed by a classification Officer.
WSMS-LP-03-0007	10/3/03	Lawrence Livermore Radiological Consequence Analysis for unit Quantity Releases		Y	Classification Marking (Official Use Only) was on the coversheet but was not signed by a classification Officer.
WSMS-LP-03-0008	10/3/03	Lawrence Livermore Downwind Dilution Factor Determination		Y	Classification Marking (Official Use Only) was on the coversheet but was not signed by a classification Officer.
WSMS-LP-03-0009	10/3/03	Accident Analysis for the Onsite Transporation of MM and RHWM Packages		Y	Classification Marking (Official Use Only) was on the coversheet but was not signed by a classification Officer.
HC/AB-TSD-0501	3/29/05	Mass Multiplier Table for TSD (Transportation Safety Document)	Y	Y	
HC/AB-B696-0202	6/7/02	Radiolytic Hydrogen Deflagration	N	Y	P6, C3, C5, C6
HC/AB-B696-0203	10/25/02	WMD Dose Consequence Analysis	N	Y	P6, C1, C3,C5, C6

Attachment 3

List of the Review Checklists of the Safety Basis Calculations that are referred in the Nuclear Materials Transportation Safety Manual

Calculation Title: Frequency of human error induced accident during onsite transfer of a Materials Management (MM) package at LLNL				
Calculation Number: WSMS-LP-03-0002	Date Calculation Approved: 10/3/03			
		Y	N	N/A
Preparer Actions				
P1	Sequential sheet number on each sheet	X		
P2	Total number of sheets on each sheet	X		
P3	Unique calculation number on each sheet	X		
P4	Revision identified on each sheet	X		
P5	Calculation Cover Sheet Attached and preparer sections filled in	X		
P6	Security Classification determined and document is appropriately marked		X	
Calculation Body				
C1	Table of contents (required if calculation contains attachments or appendices)	X		
C2	Revision Description (Optional)			X
C3	Open Items (required for preliminary calculations)		X	
C4	References (required if references are key to the calculation)	X		
C5	Input (required for all calculations)	X		
C6	Analytical Methods and Computations (required for all calculations)	X		
C7	Results (required for all calculations)	X		
C8	Conclusion (required for all calculations)	X		
C9	Attachments and appendices (optional)			X
Review and approval				
R1	Review method listed on Calculation Cover Sheet	X		
R2	Reviewer signed and dated calculation	X		
R3	Responsible Manager signed and dated calculation	X		
R4	Facility Manager signed and dated calculation	X		
Calculation by Others (subcontractors to LLNL)				
S1	Cover sheet prepared			X
Comments				
Even though the Calculational Note was prepared and technically reviewed by WSMS personnel, it was developed per AB-006 and approved by proper LLNL Responsible Manager and Facility Manager. Therefore, no cover sheet was prepared.				

Calculation Title: Frequency Estimation of a Criticality at LLNL due to a RHWM Transfer Accident				
Calculation Number: WSMS-LP-03-0003 (Rev. 1)		Date Calculation Approved: 10/3/03		
		Y	N	N/A
Preparer Actions				
P1	Sequential sheet number on each sheet	X		
P2	Total number of sheets on each sheet	X		
P3	Unique calculation number on each sheet	X		
P4	Revision identified on each sheet	X		
P5	Calculation Cover Sheet Attached and preparer sections filled in	X		
P6	Security Classification determined and document is appropriately marked		X	
Calculation Body				
C1	Table of contents (required if calculation contains attachments or appendices)	X		
C2	Revision Description (Optional)	X		
C3	Open Items (required for preliminary calculations)		X	
C4	References (required if references are key to the calculation)	X		
C5	Input (required for all calculations)	X		
C6	Analytical Methods and Computations (required for all calculations)	X		
C7	Results (required for all calculations)	X		
C8	Conclusion (required for all calculations)	X		
C9	Attachments and appendices (optional)			X
Review and approval				
R1	Review method listed on Calculation Cover Sheet	X		
R2	Reviewer signed and dated calculation	X		
R3	Responsible Manager signed and dated calculation	X		
R4	Facility Manager signed and dated calculation	X		
Calculation by Others (subcontractors to LLNL)				
S1	Cover sheet prepared			X
Comments				
Even though the Calculational Note was prepared and technically reviewed by WSMS personnel, it was developed per AB-006 and approved by proper LLNL Responsible Manager and Facility Manager. Therefore, no cover sheet was prepared.				

Calculation Title: Lawrence Livermore Radiological Consequence Analysis for unit Quantity Releases				
Calculation Number: WSMS-LP-03-0007	Date Calculation Approved: 10/3/03			
		Y	N	N/A
Preparer Actions				
P1	Sequential sheet number on each sheet	X		
P2	Total number of sheets on each sheet	X		
P3	Unique calculation number on each sheet	X		
P4	Revision identified on each sheet	X		
P5	Calculation Cover Sheet Attached and preparer sections filled in	X		
P6	Security Classification determined and document is appropriately marked		X	
Calculation Body				
C1	Table of contents (required if calculation contains attachments or appendices)	X		
C2	Revision Description (Optional)			X
C3	Open Items (required for preliminary calculations)		X	
C4	References (required if references are key to the calculation)	X		
C5	Input (required for all calculations)	X		
C6	Analytical Methods and Computations (required for all calculations)	X		
C7	Results (required for all calculations)	X		
C8	Conclusion (required for all calculations)	X		
C9	Attachments and appendices (optional)	X		
Review and approval				
R1	Review method listed on Calculation Cover Sheet	X		
R2	Reviewer signed and dated calculation	X		
R3	Responsible Manager signed and dated calculation	X		
R4	Facility Manager signed and dated calculation	X		
Calculation by Others (subcontractors to LLNL)				
S1	Cover sheet prepared			X
Comments				
Even though the Calculational Note was prepared and technically reviewed by WSMS personnel, it was developed per AB-006 and approved by proper LLNL Responsible Manager and Facility Manager. Therefore, no cover sheet was prepared.				

Calculation Title: Lawrence Livermore Downwind Dilution Factor Determination				
Calculation Number: WSMS-LP-03-0008	Date Calculation Approved: 10/3/03			
		Y	N	N/A
Preparer Actions				
P1	Sequential sheet number on each sheet	X		
P2	Total number of sheets on each sheet	X		
P3	Unique calculation number on each sheet	X		
P4	Revision identified on each sheet	X		
P5	Calculation Cover Sheet Attached and preparer sections filled in	X		
P6	Security Classification determined and document is appropriately marked		X	
Calculation Body				
C1	Table of contents (required if calculation contains attachments or appendices)	X		
C2	Revision Description (Optional)			X
C3	Open Items (required for preliminary calculations)		X	
C4	References (required if references are key to the calculation)	X		
C5	Input (required for all calculations)	X		
C6	Analytical Methods and Computations (required for all calculations)	X		
C7	Results (required for all calculations)	X		
C8	Conclusion (required for all calculations)	X		
C9	Attachments and appendices (optional)	X		
Review and approval				
R1	Review method listed on Calculation Cover Sheet	X		
R2	Reviewer signed and dated calculation	X		
R3	Responsible Manager signed and dated calculation	X		
R4	Facility Manager signed and dated calculation	X		
Calculation by Others (subcontractors to LLNL)				
S1	Cover sheet prepared			X
Comments				
Even though the Calculational Note was prepared and technically reviewed by WSMS personnel, it was developed per AB-006 and approved by proper LLNL Responsible Manager and Facility Manager. Therefore, no cover sheet was prepared.				

Calculation Title: Accident Analysis for the Onsite Transportation of MM and RHWM Packages				
Calculation Number: WSMS-LP-03-0009	Date Calculation Approved: 10/3/03			
		Y	N	N/A
Preparer Actions				
P1	Sequential sheet number on each sheet	X		
P2	Total number of sheets on each sheet	X		
P3	Unique calculation number on each sheet	X		
P4	Revision identified on each sheet	X		
P5	Calculation Cover Sheet Attached and preparer sections filled in	X		
P6	Security Classification determined and document is appropriately marked		X	
Calculation Body				
C1	Table of contents (required if calculation contains attachments or appendices)	X		
C2	Revision Description (Optional)			X
C3	Open Items (required for preliminary calculations)		X	
C4	References (required if references are key to the calculation)	X		
C5	Input (required for all calculations)	X		
C6	Analytical Methods and Computations (required for all calculations)	X		
C7	Results (required for all calculations)	X		
C8	Conclusion (required for all calculations)	X		
C9	Attachments and appendices (optional)	X		
Review and approval				
R1	Review method listed on Calculation Cover Sheet	X		
R2	Reviewer signed and dated calculation	X		
R3	Responsible Manager signed and dated calculation	X		
R4	Facility Manager signed and dated calculation	X		
Calculation by Others (subcontractors to LLNL)				
S1	Cover sheet prepared			X
Comments				
Even though the Calculational Note was prepared and technically reviewed by WSMS personnel, it was developed per AB-006 and approved by proper LLNL Responsible Manager and Facility Manager. Therefore, no cover sheet was prepared.				

Calculation Title: Mass Multiplier Table for TSD (Transportation Safety Document)				
Calculation Number: HC/AB-TSD-0501	Date Calculation Approved: 3/29/05			
		Y	N	N/A
Preparer Actions				
P1	Sequential sheet number on each sheet	X		
P2	Total number of sheets on each sheet	X		
P3	Unique calculation number on each sheet	X		
P4	Revision identified on each sheet	X		
P5	Calculation Cover Sheet Attached and preparer sections filled in	X		
P6	Security Classification determined and document is appropriately marked	X		
Calculation Body				
C1	Table of contents (required if calculation contains attachments or appendices)	X		
C2	Revision Description (Optional)			X
C3	Open Items (required for preliminary calculations)		X	
C4	References (required if references are key to the calculation)	X		
C5	Input (required for all calculations)	X		
C6	Analytical Methods and Computations (required for all calculations)	X		
C7	Results (required for all calculations)	X		
C8	Conclusion (required for all calculations)	X		
C9	Attachments and appendices (optional)	X		
Review and approval				
R1	Review method listed on Calculation Cover Sheet	X		
R2	Reviewer signed and dated calculation	X		
R3	Responsible Manager signed and dated calculation	X		
R4	Facility Manager signed and dated calculation	X		
Calculation by Others (subcontractors to LLNL)				
S1	Cover sheet prepared			X
Comments				
Even though the Calculational Note was prepared and technically reviewed by WSMS personnel, it was developed per AB-006 and approved by proper LLNL Responsible Manager and Facility Manager. Therefore, no cover sheet was prepared.				

Calculation Title Radiolytic Hydrogen Deflagration				
Calculation Number: HC/AB-B696-0202		Date Calculation Approved: 6/7/2002		
Strictly meets AB-006 requirements:		Y	N	N/A
Preparer Actions				
P1	Sequential sheet number on each sheet	X		
P2	Total number of sheets on each sheet	X		
P3	Unique calculation number on each sheet	X		
P4	Revision identified on each sheet	X		
P5	Calculation Cover Sheet Attached and preparer sections filled in	X		
P6	Security Classification determined and document is appropriately marked		X	
Required Section Headings in Calculation Body				
C1	Table of contents (required if calculation contains attachments or appendices)		X	
C2	Revision Description (Optional)	X		
C3	Open Items (required for preliminary calculations)			X
C4	References (required if references are key to the calculation)	X		
C5	Input (required for all calculations)		X	
C6	Analytical Methods and Computations (required for all calculations)		X	
C7	Results (required for all calculations)	X		
C8	Conclusion (required for all calculations)	X		
C9	Attachments and appendices (optional)	X		
Review and approval				
R1	Review method listed on Calculation Cover Sheet	X		
R2	Reviewer signed and dated calculation	X		
R3	Responsible Manager signed and dated calculation	X		
R4	Facility Manager signed and dated calculation	X		
Calculation by Others (subcontractors to LLNL)				
S1	Cover sheet prepared	X		
Comments				
P6: No security marking.				
C3: While not having the specific sections, there is no open item based on the conclusion.				
C5 & C6: While not having the specific sections, the calculation has similar or more detailed sections for these items.				

Calculation Title WMD Dose Consequence Analysis				
Calculation Number: HC/AB-B696-0203		Date Calculation Approved: 10/25/2002		
Strictly meets AB-006 requirements:		Y	N	N/A
Preparer Actions				
P1	Sequential sheet number on each sheet	X		
P2	Total number of sheets on each sheet	X		
P3	Unique calculation number on each sheet	X		
P4	Revision identified on each sheet	X		
P5	Calculation Cover Sheet Attached and preparer sections filled in	X		
P6	Security Classification determined and document is appropriately marked	X		
Required Section Headings in Calculation Body				
C1	Table of contents (required if calculation contains attachments or appendices)		X	
C2	Revision Description (Optional)	X		
C3	Open Items (required for preliminary calculations)			X
C4	References (required if references are key to the calculation)	X		
C5	Input (required for all calculations)		X	
C6	Analytical Methods and Computations (required for all calculations)		X	
C7	Results (required for all calculations)	X		
C8	Conclusion (required for all calculations)	X		
C9	Attachments and appendices (optional)	X		
Review and approval				
R1	Review method listed on Calculation Cover Sheet	X		
R2	Reviewer signed and dated calculation	X		
R3	Responsible Manager signed and dated calculation	X		
R4	Facility Manager signed and dated calculation	X		
Calculation by Others (subcontractors to LLNL)				
S1	Cover sheet prepared	X		
Comments				
P6: Classified as Designated Unclassified Subject Areas (DUSAs) and signed but not official marking.				
C5 & C6: While not having the specific sections, the calculation has similar or more detailed sections for these items.				
C3: While not having the specific sections, there is no open item based on the conclusion.				
C1: No table of contents.				
TSD DSA				